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APPENDIX A

Original research proposal,
"Alternative Policies for Pollution Abatement:
The Ontario Pulp and Paper Industry."

ANALYSIS OF POLLUTION ABATEMENT ALTERNATIVES FOR THE PULP AND PAPER INDUSTRY IN ONTARIO

I Introduction

(A) The Problem of Choice

The stated goal of the Ontario Ministry of the Environment is "to ensure proper controls over the emissions of contaminants into the natural environment for the purposes of achieving and/or maintaining predetermined standards of environmental quality".[1] Three inter-related functions of the Ministry are implied in this objective:

1. Specification of environmental standards or objectives.
2. Determination of the proper controls of emissions.
3. Determining ways in which the Ministry can best "ensure" these controls.

Ideally, the Ministry would specify emission levels for each contaminant which will protect or enhance human well-being. Thus defined, the government would require firms, municipalities and other sectors of society to maintain these discharge levels. However, there are a number of factors which complicate this process. Attainment of high levels of pollution control may conflict with other desirable objectives. Incomplete knowledge of how different waste materials affect health, human activities and aesthetics may prevent the precise determination of environmental quality standards. Technology and the assimilative capacities of the environment vary with time and location so that a given set of standards may not be applicable at different times or for all locations. Finally, even governments do not have unlimited funds with which to buy everything it wants all at once.

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Firms, governments and individuals must allocate scarce resources among competing uses and pollution control might well have a low priority.

It is therefore extremely difficult to establish the optimal level of waste emissions since there are so many competing interests and values to consider, and there is a dearth of factual information. Nevertheless, in the absence of government controls over waste emissions it is highly likely that some of these emissions would result in environmental costs for which there would be no compensating benefits. It is, therefore, a primary function of the Ministry of the Environment to gather information and to implement policies which will counteract the tendency of those who pollute to ignore the costs of their pollution and thus to minimize their efforts to control emissions of waste.

For rational policy formulation, environmental goals must be expressed in an explicit and systematic manner. An examination of several documents which are intended to articulate environmental policy for Ontario reveal that environmental objectives for air and water are not clearly defined.[2] Water quality criteria for specific water uses in Ontario have been published but are not legally established standards.[3] Effluent loading objectives used by the Ministry in pollution control programs are often based on the best available technology rather than receiving water quality criteria. Environmental objectives may, therefore, be expressed in terms of ambient quality or in terms of the quality and quantity of effluents. In addition, the Ministry might elect to constrain environmental objectives by specifying that effluent or ambient quality standards must be achieved without losses

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of employment or income in specific locations.

Given an objective, there are several ways in which the government might undertake to achieve it. Pollutors may be coerced to reduce their emissions by various regulation and enforcement approaches. Alternatively, the government might provide incentives for pollution abatement through grants, loans or other subsidies. The combination of an objective and the policy instrument chosen to achieve it comprise an environmental policy. Each alternative policy has a different configuration of advantages and disadvantages; benefits and costs. The government must, therefore, make a choice as to which policy or combination of policies it should adopt.

The steps required for formulating policies are summarized as follows:

1. An environmental objective is specified explicitly.
2. Alternative policy instruments aimed at achieving the objective are specified.
3. The consequences of each policy or combination of policies are predicted.
4. These consequences are compared in terms of a scale of desirability.
5. Objectives may be revised in light of new information or perceived changes in public demands or preferences. If so, steps 1 through 4 are repeated.
6. A policy is selected on the basis of a decision criterion.

This study will apply the first three steps to the pulp and paper industry in Ontario. The reasons for focusing on this industry are presented below.

(B) The Pulp and Paper Industry in Ontario

The pulp and paper industry is vital to Ontario and to Canada in terms of employment, foreign exchange, value added and providing income to northern communities.[4] However, the industry is also a major source of water pollution in the Province, contributing 87% of the BOD_5 and 48% of the suspended solids currently being discharged into Ontario's lakes and streams.[5] Local odour problems also arise in some of the older Kraft mills.

The Industrial Wastes Branch of the Ministry of the Environment has sought to abate pollution from this industry in the following manner. Targets or objectives for effluent loadings are set by the Branch and the specific treatment needed to attain these loadings is estimated for each mill. The Branch then negotiates with each firm as to when treatment equipment will be installed. To date, nearly all mills in the Province have instituted in-plant waste control practices and have installed processes which remove some solids from the plant waste waters.

However, efforts by the Ministry of the Environment to get mills to install secondary waste treatment facilities have been firmly resisted by the industry.[6] Many companies have maintained that they are financially unable to afford additional waste water treatment costs.[7] The industry warns than an unspecified number of mills would be closed if all firms are forced to install secondary treatment equipment. Unemployment and the loss of income for northern Ontario communities are threatened as a result of achieving environmental objectives. The Ministry is, therefore, reluctant to prosecute firms for non-compliance with abatement programs.

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In view of the difficulties that have confronted the implementation of the Ministry's current policy, it is useful to consider alternative environmental policies for the pulp and paper industry in Ontario.

II Objectives of the Study

The study is intended to specify feasible policy options for achieving environmental objectives with respect to the pulp and paper industry. The consequences of each policy alternative will be assessed in terms of costs to the industry, employment, economic impact on mill towns, costs to the Province and effects on the environment.

The analysis is directed at providing the Policy Field Committee and the Management Board with quantitative comparisons about the consequences of alternative environmental policies specific to the pulp and paper industry. The study will also provide information and data about the industry and about specific mills which the Industrial Wastes Management Branch can utilize with respect to its current abatement program.

The study will not advocate a particular policy. It is intended to develop information for input into the policy evaluation and selection process.

III Methodology and Plan of Study

The study consists of seven basic components which are detailed below. They are listed in the order of logical sequence rather than any implied importance.
A schematic representation of the study and the interfaces among each study component are presented in Figure 1.

(A) Environmental Objectives

As noted earlier, environmental objectives of the Ministry are rather vague and ill-defined. Furthermore, there are some obvious conflicting objectives which must be considered as constraints to environmental goals. Therefore, several alternative environmental objectives will be specified and examined. The costs, benefits and other consequences of achieving these different objectives will be made explicit.

Tentatively, the effects of the following objectives will be studied:

1. Achieve complete pollution abatement in all mills. Specifically, liquid effluents would not preclude swimming and odours from mills would be eliminated.
2. Adjust effluents of each mill to assimilative capacity of receiving waters. Water quality should maintain the aquatic community which is, or ought to be, specific to the receiving waters.
3. Classify receiving waters by current uses and effect the pollution control necessary to achieve them.
4. Constrain objectives 1 - 3 by not permitting any mill closures.
5. Constrain objectives 1 - 3 by not permitting mill closures in specific locations (yet to be specified).

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(B) Policy Instruments

A firm may reduce the environmental impact of its waste output in four essential ways:

(1) By a reduction in the output of product.

(2) By changing production processes; increasing the conversion rate or changing the inputs and outputs of the plant.

(3) By recycling wastes.

(4) By treating wastes.

Each of these methods involves additional costs to the firm or, in the case of method 1, a loss of income. However, in each but the last method there is a compensating gain to the firm in terms of lower costs or increased income. Waste treatment generally involves added costs to a firm with no offsetting income. Government environmental policies seek to induce or require firms to reduce the impact of their waste output. The policy may specify one or more of the above approaches or it may leave this decision up to the firms. The firm itself would normally know which of these technical alternatives would be most suitable for its own situation. Policy instruments might, therefore, be directed at altering the situation in which the firm operates rather than specifying the technology to be used. This would allow the different firms to choose a waste reduction technology which best fits its own circumstances.

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There are at least five distinct policy approaches which the government might use singly or in combination to achieve environmental objectives. They are described briefly below.

(1) Effluent Standards or Objectives

Limits on the quantity and quality of waste effluents are specified. The word 'standards' implies that these limits are specified in law. Pollutors who do not meet effluent standards face prosecution in the courts. The terms 'guidelines' or 'criteria' indicate that the allowable effluent levels are set by the regulatory agency and can be enforced at their discretion.

Ideally, effluent standards or criteria would be set so as to maintain desired ambient quality standards. A varient of this policy is water classification. A water body is classified according to a specific use. Ambient quality standards are based on those required to preserve or enhance this use. Effluent loadings are then established so as to preserve the ambient water quality.

Effluent standards or criteria are often set somewhat arbitrarily with the intention of revising them after more is learned about the environmental effects of specific materials in a particular location. The regulating agency may or may not specify the manner in which standards are to be achieved.

(2) Specification of Technology

The government requires that firms employ a specific type of technology such as treatment, recycling or process changes; or it could refer to specific treatment processes. All firms may be required to install the same

kind of technology or the policy might be more selective, allowing for different environmental circumstances at each location.

(3) Effluent Charges

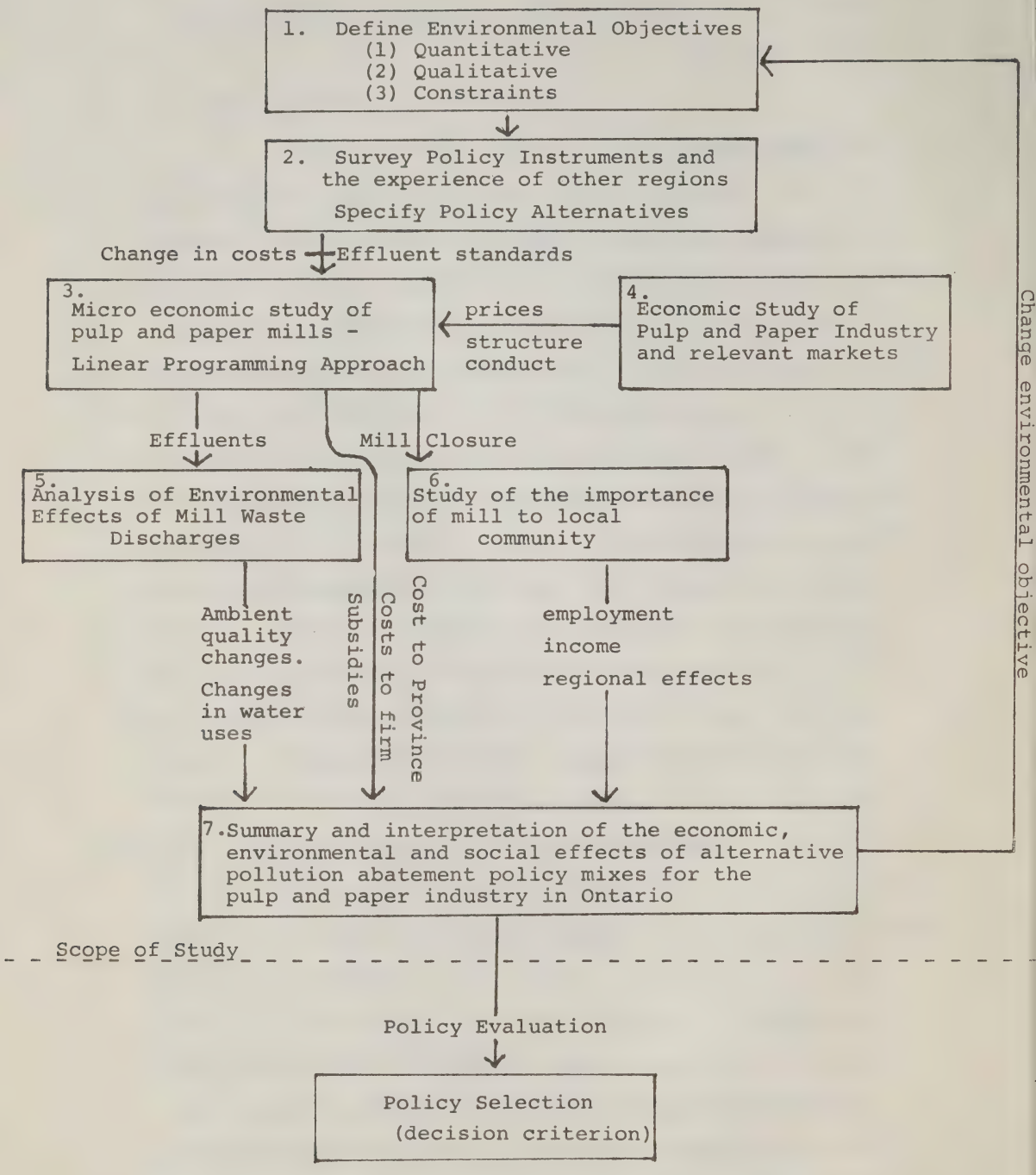
Many firms are currently using the waters and the air of the Province to dispose of wastes free of charge. In some instances the current profitiability of particular establishments depends on this "environmental subsidy". This policy proposes to charge firms for this particular factor of production which they have previously been using at no cost.[8] Effluent charges can be made so high as to completely exclude a particularly lethal contaminant or they can be set so as to induce firms to partially reduce waste discharges. The generation of revenue by effluent charges is of secondary importance.

Effluent charges have the advantage of being flexible and of generating information about the quantity and quality of effluents. They are, however, only an indirect control over waste effluents.

Some see effluent charges as a license to pollute which, once paid, absolves the discharger from any responsibility for damages caused by its wastes. The adoption of effluent charges may, therefore, require legislation to specify where such responsibility resides. Another criticism of this approach is that it would not guarantee an improvement of environmental quality, but would allow the industry to pay and continue polluting. The question here is how much would the effluent charge have to be to induce the firm to reduce its effluents?

Figure 1

Diagram of Policy Analysis of Pulp and Paper Industry in Ontario



This question is being addressed in this study. It should be appreciated that added costs to a firm are an effective incentive for action. At present, firms bear no direct costs for those wastes which are discharged into the environment.

Effluent charges are being considered by the Canadian Federal Government and have been adopted in principle by the Province of British Columbia. For this reason alone it behoves this Ministry to examine the possibilities and the implications of this policy for Ontario.

(4) Subsidy Programs

Some form of direct or indirect financial assistance might be given to the industry for purposes of pollution abatement. One proposal for grants to the pulp and paper industry in this Province has been made.[9] Other forms of subsidies include low interest loans, depreciation allowances and tax concessions.

Another suggested variation of this policy involves estimating the costs of meeting specific environmental objectives for each mill in the Province. Each mill would then be assessed a proportion of the total cost based on some weighting formula. All pollution abatement facilities would then be financed from this fund. The government could reduce the amounts assessed each firm by applying specific or general subsidies. The primary problem is choosing the criteria which determines how much each firm will have to pay. Different criteria will yield significantly different distributions of assessment.

(5) Sale of Assimilative Capacity of the Environment

In situations where the assimilative capacity of the relevant environment is reasonably well known, then

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part or all of this capacity might be leased by the government to waste dischargers.[10] As with any commodity the seller can determine the price or the quantity sold but not both. When effluent charges are used, the government sets the price that firms must pay to discharge effluents. If the total effluent discharges exceed the desired amount then the government can raise the effluent charge accordingly. With the sale of a fixed amount of assimilative capacity, however, the control over the total amount of effluent discharged is more direct since the total is predetermined and only the price paid by individual dischargers is settled via a competitive process.

It is important to recognize that each of these policy instruments may be combined with one another. For example, the Ministry's present policy toward the pulp and paper industry includes both effluent quality guidelines and specification of the level of treatment. Indeed, because of the diversity from one mill to another, it is likely that some combination of two or more of the policy instruments will be needed to make the final policy flexible enough to account for each situation. Moreover, new approaches like effluent charges or the auctioning of assimilative capacity will probably have to be associated with effluent standards and subsidies, particularly during the initial stages of policy implementation. Specific policy mixes will be examined in the course of the study.

The final report will contain a more complete a priori analysis of the theoretical pros and cons of each policy alternative. The object of the study itself is to provide empirical information with which each alternative can be compared.

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Implications with respect to enforcement and administration are being examined and experience which other governments have had with each policy instrument is presently being surveyed.[11]

(B) Model of Mills

In order to study the effects of each policy on a locational basis and to estimate the results in terms of waste output, mill closures and unemployment, a general model of pulp and paper processes will be developed in a linear programming format along the lines suggested by Clifford Russell.[12]

Outputs of pulp and paper products and waste discharges are approximated as linear functions of production and waste treatment activities. With profit maximization and cost minimization as objective functions of the firm, quantitative changes in outputs, inputs and waste emissions resulting from different configurations of product prices, costs of factors or inputs, and costs of waste treatment can be calculated. The model is capable of indicating when changes in products or processes might be chosen as a means of curbing waste discharges.

An important policy aspect which the model of the firm will allow us to examine is the difference in costs resulting from imposing pollution control restrictions equally on all mills as opposed to permitting firms to take advantage of the assimilative capacity of their local environment in designing their waste treatment facilities.

In situations where the environmental benefits of pollution abatement are not clear, the model will, at least, show explicitly the amount and the incidence of the costs of each different policy.

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Data on the technical aspects of treatment processes, production change capabilities, costs of these processes per unit of product or waste discharge and treatment requirements are being collected for each mill location. The Industrial Wastes Branch of this Ministry is providing much of this technical data. The Government Services Department is providing assistance in the computational aspects of the model.

(C) Environmental Effects

The environmental effects of each policy result from changes in the quantity and quality of mill waste effluents. Conceptually, the value of a particular water body is determined by the uses made of it. Water uses are a function, in part, of water quality and water quality is determined, again in part, by waste discharges. Environmental effects will be expressed as to whether changes in waste discharges will allow or preclude particular uses of the water body in question. These changes will be evaluated in terms of location, accessibility, health hazards, recreation demand and protection of aquatic life.

Data have been collected regarding the uses being made on each of the water bodies receiving paper mill wastes. Water and air quality information for each mill location is presently being collected. The Water Quality Branch has been approached for assistance in this and other aspects of the study.

(D) Market Study

The willingness of a firm to invest in waste treatment facilities depends in part on its profitability. The profitability of firms depends on the relation of the price of paper products to the average costs of the mill in question.

Costs are being examined in the micro-analysis of mills. Factors which affect current and future prices are considered in this section. Characteristics of the market for pulp and paper relevant to Ontario are, therefore, being studied. Demand characteristics, competition, price behavior, ownership, patterns of technical change and financial features of the industry are being investigated to determine whether or not they affect the environmental performance of particular firms or mills.

(E) Importance of Mills to Communities

Mill closures can impose serious social and economic hardships on many northern Ontario communities where paper mills are the only source of jobs and income. The importance of each pulp and paper mill to its respective community is being documented with respect to employment and income generated. Each of the mill locations will be assessed in terms of alternative employment opportunities and possible government welfare costs. The collecting of this data is well under way.

IV Expected Results of the Study

The seventh component of the analysis will present a summary and interpretation of the economic, environmental and social effects of each alternative policy on individual mills and the industry as a whole. Information and data will be generated for each pulp and paper mill in the Province concerning:

1. The costs of pollution abatement
2. The social effects of each policy

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3. The costs to government
4. Specific environmental effects
5. The condition of the market

The results will be presented in a summary matrix for each mill and for the industry. Tentative formats for these tables are presented in Figures 2 and 3.

This study is intended to provide a framework for the integration of economic, biological and engineering expertise for solving a specific problem. The various options available for achieving specified gaols are identified and the consequences of each option are made explicit. The information thus generated can be evaluated and policies can then be formulated on a broadly based, interdisciplinary view of the issues. The methodology used in this analysis can be applied to other industries for which a number of pollution abatement alternatives exist. Above all, the study will demonstrate the efficacy and utility of this kind of research for rational policy formulation and selection.

Figure 2

Format for Summary of Consequences for Alternative Polices for ____ (one table for each mill)

Policy Alternative	Nature of Response (1)	Costs to Mill	Subsidy to Mill	Cost or (2) income to government	Social (3) impact	Environmental Effects (4)	Significant Enforcement or Administrative problems (5)	Comments
1.								
2.								
3.								
4.								
5.								
etc.								

(1) Kind of treatment facilities installed, process changes Expected change in waste discharge, output. Potential for closure

(2) Includes subsidies and administrative costs; income from effluent charges

(3) Losses of jobs, income to specific communities

(4) Expressed in as quantitative a manner as possible

(5) Politically sensitive etc.

Figure 3

Format for Summary of Consequences for Alternative Policies on Pulp and Paper Industry in Ontario

Policy Alternative	Costs to Firms	Subsidies to Firms	Cost or income to government	Social impact	Environmental Effects	Significant Enforcement or Administrative Problems	Comments
1.							
2.							
3.							
4.							
etc.							

FOOTNOTES

1. Statement of the Honourable J.A.C. Auld, Reorganization Announced for Ministry of the Environment, News Release, November 22, 1973, p.3

2. Documents examined were:

   (i) "The Ontario Water Resources Act", Revised Statutes of Ontario, 1970, Chapter 332; as amended by 1972 Chapter 1, S.70, October 1970

   (ii) "The Environmental Protection Act" Statutes of Ontario 1971, Chapter 86; as amended by 1972, Chapter 1, S. 69, and 1972, Chapter 106, (amended 1972) August 1972

   (iii) "The Role of the Ministry of the Environment" Task Force on the Role of the Ministry, draft mimeo, March 16, 1973

   (iv) Multi-Year Program 1974/75 - 1976/77, Ontario Ministry of the Environment, 1972

   (v) Statement of the Honourable J.A.C. Auld, Reorganization Announced for the Ministry of the Environment, News Release, November 22, 1973 p.3

3. Ontario Water Resources Commission, Guidelines and Criteria for Water Quality Management in Ontario, Toronto: Ontario Ministry of the Environment, June 1970

4. In 1971, Pulp and Paper accounted for about 12 percent of total Canadian Exports. The industry ranks first among all Canadian industrial sectors in terms of employment, wages paid and value added. John J. Hofbauer, A Discussion of Industrial Strategy for the Ontario Pulp and Paper Industry. Unpublished manuscript, University of Western Ontario, London, Ontario April 1973, p.3-4

5. Financial Assistance to the Pulp and Paper Industry to Accelerate the Water and Air Pollution Abatement Program, Ministry of the Environment, April, 1973 p 4

6. Ibid. p.1

7. Report to Ministers on Tri-Partite meetings with Manufacturers Of Newsprint in Ontario and Quebec, Ministry of Natural Resources, (Resources and Recreation) February 13, 1973

8. Financial Assistance to the Pulp and Paper Industry to Accelerate the Water and Air Pollution Abatement Program, Op. Cit.

9. For a detailed exposition of this approach see Allan Kneese and Blair T. Bower, Water Quality Management: Technology Economics and Institutions, Baltimore, Resources for the Future, 1968,
   and
   Freeman and Haveman, "Residuals Charges for Pollution Control: A Policy Evaluation", Science 322 (1972)

10. For an analysis of this approach see J. H. Dales, Pollution, Property and Prices, (Toronto: University of Toronto Press, 1970)

11. See, for example, Richard Judy, Preliminary Draft - Policy Instruments Relating to Water Use, Consultants Report Prepared for the Water Management Sector Group and the Sub-Committee for Economic Experts

12. Clifford S. Russell, "Models for Investigation of Industrial Response to Residuals Management Action" Resources for the Future, reprint series.

APPENDIX B

Documentation regarding experience with
policy instruments in other areas.

1. A. Penman, "The Experience with the Effluent Charge Scheme of the City of Winnipeg (Feb. 14, 1974)

2. John Demakes, "Effluent Charge Schemes in Canada (other than Winnipeg).

THE EXPERIENCE WITH THE EFFLUENT CHARGE SCHEME OF THE CITY OF WINNIPEG

by
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Presented to The Department of the Environment
Hull, P.Q.
February 14, 1974.

The continual trend towards urbanization in modern society has resulted in the production of large volumes of waste material, by-products of our urban way of living, which must be disposed of in confined areas. The disposal of these waste materials has greatly taxed the existing disposal facilities and in many areas the rivers have been reduced to conditions approaching open sewers. In addition, industrial development has been accelerating since the last European War and every day brings new processes and new problems. It was not so many years ago that detergents, insecticides, plastics, petrochemicals, antibiotics and various synthetic products were either unknown or of little importance. Today, these materials are produced in large quantities. On the horizon we see industrial development of atomic energy and the promise of new and more complex problems.

Pollution of bodies of water was not too great a factor as long as communities were small and society relatively primitive. However, two factors have steadily tended to make the pollution problem complicated so that it is now an item of high priority in urban society.

The first of these factors is the rapid and continuous expansion of our industries, using more and more water and discharging increasing quantities of wastes. The second factor is the continual demand for a better standard of living, with a resultant increase in man's leisure time. Society has turned its attention to ways of occupying this time. Recreation, and in particular water sports, have focused public attention on the condition of our bodies of water.

In the past 20 years, and more noticeably in the past several years, the public, and in particular conservation groups, have been insisting that our rivers and lakes be returned to a pristine pure condition. To restore our rivers and lakes to the conservationists' ideal state may not be practical, but to

insist that our waterways be preserved in a state whereby they serve everyone's interests is not only practical but must be considered an item of high priority.

The disposal of human and industrial wastes is, in the main, by the water carriage method, whereby liquid wastes are conveyed by sewers to a disposal facility, be it a receiving stream or a treatment plant. The control and disposal of domestic wastes from households is, without question, a community responsibility and the community must bear the total cost of same. On the other hand, industries as a source of industrial wastes are in business to accrue profits for their owners and in the course of earning these profits, produce industrial wastes. Should these wastes be considered the responsibility of the community as a whole? This question has to be considered very carefully as it is the crux of the problem in arriving at a philosophy of industrial waste control.

In developing a philosophy, it must be remembered that industry contributes to the material welfare of the community by providing profitable employment for a portion of the population, by payment of taxes and by its contributions to community welfare. Industry is not something separate and apart from the community in which it finds itself.

Industry, in the process of its operations, produces substances which may be a nuisance to the community. This may take the form of a nasal or physical nuisance and may interfere with the enjoyment of the natural resources by the people. Industry has no alternative, therefore, but to accept the responsibility for this nuisance. The community, on the other hand, has several courses of action, based on their assessment of the benefit or liability to the community of the industry in question. The community may:

(1) Accept the burden of handling industrial wastes without recompense.

(2) Accept the wastes into the public sewerage system on the basis of equitable payment based on volume or strength of wastes received, or both,

(3) Accept the wastes of industry on the basis that industry pay the capital costs of any additions to the existing treatment works required by the addition of the industrial wastes to the system.

(4) Accept the wastes of industry into the public system on the basis that industry pay an equitable charge for its wastes, based on the excess of their strength over and above the average strength of normal domestic sewage,

(5) Refuse to accept the wastes of industry and require industry to construct and operate its own treatment facilities at no expense to the community.

(6) Accept the liquid wastes into the public sewerage system only after the industry has provided pre-treatment at its expense to reduce the waste concentrations to those of the average strength of domestic sewage.

It will be appreciated that there can be no hard and fast rules which cover all conditions. A particular industry may create no problem in relation to the quantity or quality of sewage in a large city. However, it may create a problem in a town of a few thousand people where its wastes may be equivalent to a population in excess of the town itself.

It is generally conceded that the joint treatment of sewage and industrial wastes is mutually advantageous to both the community and industry. Perhaps the most important aspect towards working effectively with industry on pollution abatement is the passing and enforcement of a good sewer use regulation by the community. Once the regulation is enacted, the enforcement procedures and penalties should be employed firmly and without hesitancy. There should be no allowance for discretionary powers given to the administrators of the regulation.

Communities should be aware of all industries that are connected to the sanitary sewer system and should have current data on waste flows and characteristics, including the location of connections to the sanitary and storm systems. A number of broad objectives which the regulations should contain are as follows:

(1) To ensure protection of the community sewerage system and the personnel who are engaged in maintaining it.

(2) To ensure that the community sewage treatment plant or plants are protected and the processes which are used in treating the sewage.

(3) Outline the means of charging industry for the additional treatment costs involved in treating the stronger industrial wastes.

(4) The method of enforcing the regulations should be outlined, namely, by either taking out permits or licenses and also indicating inspection methods and penalties, etc.

Sewerage systems and treatment facilities are generally designed and operated on the basis of handling domestic wastes that are of fairly uniform quality and are received in quantities that follow an accepted pattern throughout a 24-hour period, day in and day out. Industrial wastes, however, do not always follow the same pattern of the community wastes. Most of them, however, are amenable to treatment with sanitary sewage in treatment facilities as long as the quality and quantity of the wastes are in keeping with the ability of the sewerage system and treatment facilities to handle them.

It is important that problems that can arise are recognized if industrial wastes are accepted into community facilities. Keeping a close watch on industrial effluents will minimize dangerous overloading of the community's sewerage system. The breakdown of a waste disposal facility due to it being strained beyond its capacity can be an extreme health hazard to a community. Some of the characteristics that can be expected to differ from those of normal sanitary sewage are as follows:

(1) Flow - Widely fluctuating flow volumes may hydraulically overload the facilities.

(2) Temperature - High temperatures may accelerate corrosion, place thermal stress on piping materials, adversely affecting jointing materials and cause excessive biological action in the sewers.

(3) pH - pH much above or much below 7.0 tends to accelerate corrosion and could adversely affect the biological processes at the treatment facility.

(4) Acidity and Alkalinity - Acidic wastes will accelerate corrosion of the sewerage systems and alkaline wastes can affect the chemical hardness of the sewage. If caustic alkalinity is present, calcium carbonate scale could be deposited in sewers, which leads to reduced diameter and increased surface roughness.

(5) Organic Loading - Biochemical Oxygen Demand - High or widely fluctuating organic loadings may overload or interfere with the biological process at the treatment facility.

(6) Suspended Solids - The suspended solids concentration of industrial wastes is a very important factor. If high suspended solids are allowed to discharge to the sewerage system, it may result in clogging and blocking of pipes.

(7) Toxic materials - a number of toxic materials can do harm to the organisms responsible for secondary treatment or sludge digestion - cyanide, copper, chromium, nickel, lead, cadmium, zinc, sulphides, phenolic compounds, etc.

(8) Inflammable or Explosive Materials - It is too obvious to relate the possible consequences of having inflammable or explosive materials in a sewerage system.

(9) Greases and Oils - Grease and fats in industrial wastes could build up layers and reduce flows in the sewer system. Oil can cause considerable damage to equipment that would necessitate frequent cleaning.

(10) Malodorous Gases - Any substance capable of creating a noxious or malodorous discharge should be prohibited from entering the sewerage system.

(11) Radioactive Wastes - At the present time, radioactive wastes are not normally encountered. However, it may be that in the future these wastes will require very close control to protect the public and personnel operating sewerage systems.

The Greater Winnipeg Sanitary District, established in 1935, initially relied on an educational program to persuade industries to cooperate. With the outbreak of the war in 1939, little was accomplished until the end of 1945, when further steps were taken to obtain voluntary cooperation. At that time, a by-law was passed which prohibited the discharge of certain detrimental materials and was aimed mainly at the slaughterhouses and packinghouse wastes. The educational program was not very successful. By 1950, the Sanitary District's facilities were overloaded and it was apparent that a more aggressive control program would have to be instituted.

The District's Act provided for the imposition of surcharges for extra strong sewage. The District's Consultants, however, recommended against the implementation of such charges on the grounds that they would discourage industry from constructing pre-treatment facilities. They did, however, recommend that screen chambers be constructed at the outlets from each of the packing plants at the District's expense. The screen chambers were constructed and in addition, two by-laws were enacted in 1954.

Both of these by-laws made provision for licensing, which required every person, that is, industry or municipality, to obtain a license for any sewer outlet into a river, including storm sewers and discharge of industrial wastes into the wastewater sewers. Various types of material were prohibited. Permitted in the by-laws was the installation of domestic garbage grinding units in residences but required that all larger industrial or commercial units be licensed.

While the screen chambers were successful in eliminating the solids from packing houses, such as pigs' toenails, paunch manure, the sewage from this type of industry was still fairly strong in B.O.D. and grease. Accordingly, a review and study were made of the various surcharge methods, regulations and formulas used by similar authorities.

After due consideration, it was decided that surcharges should be imposed, and a formula was developed, based on a variation of the California formula, which makes provision for a flat rate charge levied on a given number of sewage units, and the Quality-Quantity formula, which takes into consideration wastes of excessive strength.

Subsequently, a by-law was enacted. This by-law provided for surcharges for the discharge of factory and industrial wastes into sewers or rivers within or entering the District. It was passed in August 1957 and became effective on January 1, 1958.

As a result of the formation of a metropolitan government on January 1, 1961 the Sanitary District became the Waste Disposal Branch of the Metropolitan Corporation. The former Sanitary District Act was incorporated and became part of the Metro Winnipeg Act. At this time, all of the previous industrial waste by-laws enacted by the Sanitary District were reviewed and revised.

The Greater Winnipeg Sanitary District, and subsequently the Metropolitan Corporation, adopted the philosophy that the community should accept amenable wastes into the public sewerage system with an equitable payment based on volume and strength of waste received, and surcharges imposed on wastes of excessive strength. In practice, this meant that industry pays a sewer rental charge to their local municipality, based on the volume of waste discharged and surcharges were paid directly to the Metropolitan Corporation, based on volume and waste concentrations, over and above those determined as normal or by-law sewage.

Where it is proven that an industrial waste flow is unacceptable under the regulations, two courses of action are open to the community. First, the industry should be required to correct the problem so that the industry's effluent is within the regulation requirements. The other is to establish an industrial waste surcharge or effluent tax in addition to any basic sewer use charge. The latter course may seem to be a license to pollute. This is not the case. The surcharge is usually based on the cost to the community to cover the amount for the additional problems associated with treatment of the extra strength sewage.

It has been our experience that a regulation which places industry and the controlling authority in a position where industry realizes that there is very little penalty to them for not complying with the regulation, leaves them fairly well in the same position as they were before the regulation was passed.

The implementation of an equitable service charge will have very little, if any, effect on existing industries in a community relocating, or prevent new industry from locating in an area. The cost of waste disposal is a minor factor in production costs. Other factors, such as labor, transportation and raw materials are more important to industry. An inadequate sewage collection and treatment system is far more likely to discourage industry than equitable sewer service charges.

The enforcement conditions of the regulation must, of necessity, require the employment of personnel to carry out this work. While we were making enquiries originally from sewage treatment authorities regarding their regulations, it was of interest to learn that in spite of a considerable number of ordinances having been drafted, a great number of these had not been implemented, particularly in the older and larger cities. One of the main reasons was apparently the cost of administrative and technical work required to impose the regulations, and also a natural reluctance to tackle this problem with industry. We carefully studied the first of these concerns and we decided to add to our staff two permanent employees, an Industrial Waste Supervisor and a Senior Sampler. Also, depending upon the sampling load, we employed three to six casual laborers. One of the interesting sidelights of the casual laborer hiring is that we have found that retired men between the ages of 60 and 70 have proven to be most adaptable to the monotony of the job and were also the most dependable.

Regarding the second aspect, we have found that an educational program dealing with individual industries failed. However, we were able to succeed by dealing with all industries in any particular classification at one time. For instance, there are some nine packing plants within our area. Instead of dealing with each packing plant individually, we arranged a meeting with representatives from the packing plants and explained to them, as an industrial group classification, the problems, and outlined the need for the program. It was emphasized to them that they would all be treated on the same basis, whether they were a large plant or a small plant. They were given a period of time in which to install any required or desired pre-treatment facilities before the regulations were applied. In our regulations we also indicated that a sampling manhole on the sewer outlet from each industry was an important requirement. In this way, we instituted the program gradually, dealing with those industries which were responsible for the strongest and largest quantities of sewage. This also had the effect of keeping our industrial waste staff to an absolute minimum.

At the present time there are 16 types of industry within our area being routinely sampled by the Division, and quarterly surcharges are levied against a total of 50 industries. Sampling is carried out over three operating days on each plant and surcharges are computed on the basis of the averages of the composite samples collected on each of the three days. Composite samples are obtained by hand dipping from a control manhole every 15 minutes. Samples are immediately transferred to a refrigerated container. They are picked up by our Laboratory staff each day and analyses are done on the sample in accordance with the accepted procedures.

In 1971, 50 industries were surcharged, with a total revenue received in this manner in excess of $200,000. Some 4,696 manhours were expended in sampling these industries, at a labor cost of approximately $14,506. Total operating budget of the Industrial Waste Control Branch for 1971 was $36,423.

The effect of the program has been beneficial to industry and to the community. As noted previously, the consulting engineers to the Sanitary District had recommended against the imposition of surcharges, their main point being that industry would curtail the installation of pre-treatment devices. Subsequent experience has proven this advice to be ill-founded. In fact, it was not until surcharges were imposed in 1958 that industry took any major steps to reduce the concentrations of their wastes. Initial attempts at education and persuasion had little effect. Restrictive by-laws, with their threat of legal action and fines, did not speed up the installation of

pre-treatment facilities, and only when the surcharge by-law was instituted, when it became an economic advantage to industry to install pre-treatment facilities in lieu of paying surcharges, were any major advances made in reducing waste concentrations.

In our experience over the past 20 years of industrial waste control, no legal action has been taken against a violating industry. In one instance, where legal proceedings were commenced, an out-of-court settlement was made.

In the packinghouse industry, all have installed elaborate pre-treatment facilities and have effected significant reductions. Most have also been able to recover valuable by-products which have gone a long way towards paying for the pre-treatment facilities. One major packer installed air flotation equipment for grease removal at an expenditure of over $75,000 and the recovery of inedible grease from this installation has more than paid for the original cost invested. The sugar beet factory located in the area has also taken major steps to reduce its pollutional load by implementing in-plant changes which have eliminated process water and flume water wastes from their effluent. Prior to these changes this plant had an effluent whose population equivalent was in the order of 95,000 people. It now has a population equivalent of approximately 6,000. This reduction has meant not only a saving in surcharges, but also a reduction in water use and sewer rental charges.

Water conservation and by-product recovery are two areas where industry can reduce sewer service charges. The industrial waste program instituted has gone a long way in bringing these points to industries' attention, as well as having been of major assistance in the operation of the sewer collection system and treatment facilities.

In evaluating the present program, it is our belief that joint treatment still appears to be the most economical approach to industrial waste control. Considering that this concept has proven successful on a local basis, it is then conceivable that such a concept could be implemented on a regional basis.

The key to good cooperation in pollution abatement between a community and its industries discharging their wastes into the community's sewerage system is a good sewer use regulation, firmly enforced. Enlightened management realizes that pollution abatement measures imposed by a community are a necessary cost of doing business. They also realize that industrial pollution is one of the most serious problems in the majority of communities.

The problem will be solved only when all communities, large and small, recognize the danger of pollution and fully accept their responsibilities.

CITY OF WINNIPEG SURCHARGE FORMULA

$$R_i = \left(fs \frac{(Si-Sn)}{Sn} + fp \frac{(Pi-Pn)}{Pn} \right) R_n + \frac{(Ci-Cn)}{Cn} Rc + \frac{(Xi-Xn)}{Xn} R_x$$

Where R_i = Surcharge for 1,000 Gallons

fs = factor derived from costs of reducing solids, and set out in the allocation and precepts by-law.

fp = factor derived from costs of reducing B.O.D. and set out in the allocation and precepts by-law.

Si - Suspended Solids in ppm in the industrial waste.

Pi - BOD in ppm in the industrial waste.

Ci = Chlorine demand in ppm in the industrial waste.

Xi = Substance requiring additional treatment in ppm in the industrial waste.

Sn = Suspended solids in ppm in the sewage serving in base of normal.

Pn = BOD in ppm in the sewage serving as base or normal.

Cn = Chlorine requirement in ppm in the sewage serving as base or normal.

Xn = Substance requiring additional treatment in ppm in the sewage serving as base or normal.

Rn = Unit charge based on cost of treating normal sewage as set out in the allocation and precepts by-law.

Rx = Unit charges based on cost of treating any substance requiring additional treatment.

Rc = Unit charge based on cost of required chlorine as set out in the allocation and precepts by-law.

Effluent Charge Schemes in Canada
(other than Winnipeg)

John Domakeas
28/2/74

I. TORONTO

For the past seven years (since 1967), the four sewage plants in Toronto have been empowered to make agreements with industries located within the metro area so that industrial wastewater is treated and the operating expenses (not capital) charged back to them. The city is selective in that only BOD, suspended solids, grease, and (now) phenols are taken, and then only up to the limits the individual treatment plants can handle, and only if the industry agrees to primary pre-treatment.

This effluent charge scheme thus permits a rather modest charge. There is no charge for BOD up to 500 ppm, SS to 600 ppm, grease to 150 ppm, and phenols to 1 ppm. Above these free limits, a charge of $1\frac{1}{2}$¢ per pound is levied on the pollutant that is most prominent in the wastewater -- the other pollutants, if present, are not charged. This charge brings in approximately $250,000 per year in revenues. It is noted that this surcharge is expected to be revised upwards later this year.

Many of the affected companies by agreement install measuring devices, while the municipalities also have personnel to sample where feasible and necessary. In certain cases, the charge is levied on the basis of the amount of water consumed by the industry.

While there were minor complaints from industry when the surcharges were instituted, these have died down in favour of a cooperative spirit as industry comprehended that the program was actually helping industry. For example, many industries cannot acquire the land they would need if they were to treat their own BOD. It is generally appreciated that joint treatment provides economies in which all can share.

The basis of the above report was provided to me by Mr. D.C. Young, Senior Engineer in charge of Industry Wastes, Water Pollution Control Division, 11th Floor, East Tower, City Hall, Toronto.

II. EDMONTON

After about 10 years of experience with an effluent charge scheme in Edmonton, the consensus of informed opinion is that the principle has been generally accepted, and, in practice, the charges have created an effective economic incentive influencing industry to depollute. While the primary intent has from the beginning been to reduce wasteload levels, nevertheless, the charges have been set so as to recover the full cost (both capital and expense) of treating the industrial sewage. Thus, in 1973, the surcharge brought in $229,000 in revenues for the city, while the 1974 revenues are estimated to range between $350,000 to $375,000, reflecting the recent change in rates. Among industries affected are four major packing plants.

Appended to this report is Edmonton bylaw #3723, dated June 1971, which will supply the reader with background information on the charging scheme. However, the surcharge for "collection, transmission and treatment"

is at the present time being adjusted upwards. Furthermore, the "N factor" in the surcharge formula has been eliminated, with the new limits on strength ("standards") programmed as follows:

POLLUTANT	TARGET DATES		
	Immediately	1-1-1975	1-1-1977
Biochemical Oxygen Demand	700 Mg/1	500 Mg/1	300 Mg/1
Suspended Solids	400 Mg/1	350 Mg/1	300 Mg/1
Grease	200 Mg/1	150 Mg/1	100 Mg/1

Above these limits, BOD is charged 1.4¢ per pound, SS - 0.45¢ per pound, and grease 0.60¢ per pound (plus 15% if industrial point source is out of town).

The basis of the above report was provided to me by Mr. C.Z. Monahan, General Manager, Edmonton Water and Sanitation Department, 9th Floor, C.N. Tower, Edmonton, Alberta.

III. CALGARY

Calgary has had an effluent charge scheme in effect for 16 years (since 1958). Despite several "forgiveness" and "rebate" features designed to elicit affirmative depollution actions on the part of industries, the city is bringing in some $140,000 in annual revenues by charging industries connected to its sewage treatment plant for treating their effluents (this is before the effect of new rates).

Calgary's domestic sewage averages about 200 ppm of BOD and SS. It allows industries to send it sewage up to 300 ppm without charge. However, it charges industry .041 cents per thousand gallons for BOD, and .037 cents for thousand gallons for SS, for each part per million in excess of 300. In addition, for each ppm of grease above 100, .043 cents per thousand gallons is charged. The facility will not accept BOD and SS in concentrations in excess of 1,200 ppm and will not accept grease in concentration in excess of 450 ppm. While companies are not required to keep daily records of the strength of their effluents, in actual practise most companies keep good records and make these available to the authorities.

If the charge works out to a modest amount, it is "forgiven" entirely. The authorities can rebate 50% of a firm's payments over the past 3 years to the firm as an inducement for it to pre-treat its wastewater. The intent is to improve the ultimate quality of the environment by inducing industry to do the maximum amount. Nevertheless, certain firms, such as a cable manufacturing company, a potato chip firm, and a paper producer, tend to cling to the old status quo and are content to depend on the municipal treatment service even if they have to pay thousands of dollars per month. It appears difficult to force them to take positive actions. But all in all,

the experience with effluent charges has been satisfactory.

The basis for the above report was supplied by Mr. I.A. Khan, Special Projects Engineer, City of Calgary, Box 2100, Calgary, Alberta.

IV. LONDON, Ontario

While approximately $120,000 annually is raised by effluent charges imposed upon industry, it is the policy of the city of London to use persuasion and education to encourage industry to take the actions necessary to reduce their wasteloads. Effluent fees (for BOD and SS) are seen as a "last resort", as a "stick" which ideally is never used. Prolonged negotiations are conducted with industry to work out problems without resort to the by-law. Firms are given up to three years to meet negotiated standards. Reductions in full charges are often made as helpful inducements when necessary.

Nevertheless, there are many instances where firmness is required. Here, effluent charges are seen as a useful "stick", usually, but not necessarily, supplying industry with a compelling motive to act. Some problems seem difficult to resolve. For example, one firm (a brewery) is presently paying about $25,000 a year in effluent surcharges, but, despite this and other pressures, it continues to choose to rely on the city to treat its wastewater.

A copy of the 1961 by-law (# W-275-635) is appended, along with a copy of the recent revision.

The basis for the above information was supplied by Mr. Keith Roundtree City Engineer, P.O. Box 5035, London, Ontario, N6A 4L9.

V. WATERLOO REGION

Almost two years ago, the City of Kitchener decided to buttress its control by-law dealing with toxic and nuisance waste discharges with a system of effluent charges based on the strength of BOD and SS in industrial wastewater. At first there was some opposition from some affected industries in the perverted form of the "license to pollute" argument. However, when letters soliciting comments were sent to all affected companies, only two companies complained (somewhat lamely) about the charges, while the vast majority of the companies showed a great awareness of the pollution problem.

Once the charges went into effect and the industries had a hard economic inducement to do something to improve their effluents, most industries (especially the large companies) immediately implemented measures to pre-treat their wastewaters. Thus, there is little question of the effectiveness of effluent charges as a "tool of policy".

The Kitchener charge scheme is closely modelled after the Winnipeg scheme, partly because it was considered the most simple, partly because it appeared the most relevant (since both cities were confronted with meat-packing industry pollution on a major scale). However, in Kitchener only BOD and SS are charged. These two pollutants are charged equally, with the

total charge covering the operating cost of treatment, which works out to 11.45¢ per thousand gallons (1972). Up to 300 ppm (SS) and 350 ppm (BOD), there is no charge. For the excess, charges in Kitchener alone totalled $100,000 for the first year the scheme was in operation.

Present plans call for early completion of studies, so that the scheme can be expanded throughout the Waterloo region (including Cambridge, Elmira, and many other towns) by January 1, 1975. This will have the effect of doubling revenues, even if large allowances are made for improved pre-treatment that is expected. It is contemplated to adjust charges upwards to include the full cost of treatment (i.e., to include capital cost), which will bring the annual revenues to the one-half million dollar range.

The basis of the above report was supplied to me by Mr. Gerald H. Thompson, Waste Management Engineer, Region of Waterloo, Marsland Centre, 20 Erb Street, Waterloo, Ontario.

VI. OTHER MUNICIPALITIES

There are a number of other municipalities that have effluent surcharge schemes in operation, although not on as ambitious a scale as those mentioned above. The following may serve as examples.

In Prince Edward Island, the industrial waste bylaw calls for industry to pay surcharges for its wastewater treatment at Charlottetown (3 municipalities) and Summerside. Both plans are quite new, having been implemented late last year. Industrial wastes are charged if in excess of 200 ppm of BOD and/or SS, and if in excess of 150 ppm of grease, in accordance with a formula similar to that applied in Winnipeg. The level of the charge was geared to the incremental capital and operating cost of facilities (such as oversize digesters for sludge at the new Charlottetown plant that will go into operation next month) which would not be necessary except for the excessive strength of industrial effluents that must be handled. The plan has been well received (for example, a large national packinghouse which will pay about $20,000 per year would have to pay even more for its own treatment, and finds the charge in line with its experiences at other locations in Canada). This information was supplied to me by Mr. A. Hiscock, Chairman, Environmental Control Commission, P.O. Box 2000, Charlottetown, P.E.I.

In New Brunswick, Sussex has had an effluent charge scheme for treating industrial wastewater in effect for approximately 5 years. The charges are based on BOD strength and flow. This information is supplied to me by Mr. J.K.D. Hayden, Pollution Control Branch, Box 6000, Fredericton, New Brunswick.

In Hamilton, Ontario, the regional municipality can make agreements with industries to treat their wastes in excess of 300 ppm BOD and 350 ppm SS. The first agreement was negotiated in 1972, the second last year, and a third is presently being finalized. The first two agreements are each estimated to yield revenues of almost $10,000 per year. The formula used takes the higher

of the two excesses multiplied by the cost of sewage treatment (now approximately 15¢ per 1,000 gal.) multiplied by a factor of 1.333. This information was supplied to me by Mr. D. Harris, Environmental Operations Engineer, Regional Municipality of Hamilton-Wentworth, City Hall, 71 Main Street West, Hamilton, Ontario.

In Windsor, Ontario, the 1969 bylaw is presently under review by the legal department, and it appears likely that an industrial effluent charge scheme will be implemented soon. This information was supplied to me by Mr. L.S. Romano, Director of Pollution Control, 4155 Ojibway Parkway, Windsor, Ontario.

APPENDIX C

Regulations concerning waste water effluents

Federal:

1. Chlor-Alkali Mercury Regulations
2. The 1971 Federal Pulp and Paper Mill Effluent Regulations
3. Guidelines for the Pulp and Paper Effluent Regulations

Provincial:

1. Regulations Files Under Provincial Acts to 26, March 1974.

Environment Canada
Environmental Protection

Environnement Canada
Protection de l'environnement

Chlor-Alkali Mercury Regulations

Règlement sur le Mercure provenant des fabriques de chlore et de soude caustique

Regulations, Codes and Protocols Report EPS 1-WP-72-3

Water Pollution Control Directorate
April, 1972

Règlements, codes et accords Rapport EPS 1-WP-72-3

Direction générale de la lutte contre la pollution des eaux
Avril, 1972

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Inquiries pertaining to Environmental Protection Service Reports should be directed to the Environmental Protection Service, Department of the Environment, Ottawa, K1A OH3, Ontario, Canada.

Registration
No. Date
SOR/72-92 29 March, 1972

FISHERIES ACT

Chlor-Alkali Mercury Regulations

P.C. 1972-576 28 March, 1972

His Excellency the Governor General in Council, on the recommendation of the Minister of Fisheries for Canada, pursuant to sections 33 and 34 of the Fisheries Act, is pleased hereby to make the annexed Regulations for the Control of Mercury in liquid effluents discharged by Chlor-Alkali Plants.

REGULATIONS FOR THE CONTROL OF MERCURY IN LIQUID EFFLUENTS DISCHARGED BY CHLOR-ALKALI PLANTS

Short Title

1. These Regulations may be cited as the *Chlor-Alkali Mercury Regulations*.

Interpretation

2. In these Regulations,

"Act" means the *Fisheries Act*;

"composite sample" means the contents of a receptacle into which portions of the liquid effluent from a plant are delivered manually or by a sampling device;

"grab sample" means the contents of a receptacle into which portions of the liquid effluent from a plant, taken at the times specified in paragraph 5(2)(*b*), are delivered manually or by a sampling device;

"mercury" means elemental mercury and all chemical forms thereof that may be present in the liquid effluent from a plant;

"Minister" means the Minister of the Environment;

"plant" means a plant designed or operated for the production of chlorine and sodium hydroxide by means of any industrial process involving the electrolysis of sodium chloride brine;

"treatment" means the reduction of mercury, in any chemical state in the liquid effluent from a plant to or below the level specified in these Regulations.

Substance Prescribed

3. For the purpose of paragraph (*c*) of the definition "deleterious substance" in subsection 33(11) of the Act, mercury is hereby prescribed as a substance.

Enregistrement
N° Date
DORS/72-92 29 mars 1972

LOI SUR LES PÊCHERIES

Règlement sur le mercure provenant des fabriques de chlore et de soude caustique

C.P. 1972-576 28 mars 1972

Sur avis conforme du ministre des Pêches du Canada et en vertu des articles 33 et 34 de la Loi sur les pêcheries, il plaît à Son Excellence le Gouverneur général en conseil d'établir le Règlement visant le contrôle de la concentration en mercure des effluents déversés par les fabriques de chlore et de soude caustique, ci-après.

RÈGLEMENT VISANT LE CONTRÔLE DE LA CONCENTRATION EN MERCURE DES EFFLUENTS DÉVERSÉS PAR LES FABRIQUES DE CHLORE ET DE SOUDE CAUSTIQUE

Titre abrégé

1. Le présent règlement peut être cité sous le titre: *Règlement sur le mercure provenant des fabriques de chlore et de soude caustique*.

Interprétation

2. Dans le présent règlement,

«échantillon instantané» désigne le contenu d'un récipient dans lequel ont été déversées manuellement ou au moyen d'un dispositif d'échantillonnage des quantités d'effluents provenant d'une fabrique, prélevées aux moments prévus à l'alinéa 5(2)*b*);

«échantillon moyen» désigne le contenu d'un récipient dans lequel ont été déversées des quantités d'effluents provenant d'une fabrique, prélevées manuellement ou à l'aide d'un dispositif d'échantillonnage;

«fabrique» désigne une fabrique conçue ou exploitée en vue de la production de chlore et d'hydroxyde de sodium par un procédé industriel qui comprend l'électrolyse d'une saumure de chlorure de sodium;

«Loi» désigne la *Loi sur les pêcheries*;

«mercure» désigne le mercure élémentaire et toutes les formes chimiques de cet élément que l'effluent d'une fabrique peut contenir;

«Ministre» désigne le ministre de l'Environnement;

«traitement» signifie la réduction de la quantité de mercure présente sous quelque forme chimique que ce soit dans l'effluent provenant d'une fabrique au niveau spécifié dans le présent règlement ou à un niveau inférieur.

Substance prescrite

3. Aux fins de l'alinéa *c*) de la définition de l'expression «substance nocive» donnée au paragraphe 33(11) de la Loi, le mercure est par les présentes prescrit comme substance.

Permitted Deposits

4. (1) Subject to section 5, mercury in the liquid effluent from a plant may be deposited in waters frequented by fish if the quantity deposited by the plant in any day does not exceed .005 pound per ton of chlorine produced by the plant in that day.

(2) Subsection (1) does not apply until sixty days after the coming into force of these Regulations.

Sampling and Analysis

5. (1) For the purpose of subsection 4(1), the quantity of mercury in the liquid effluent from a plant shall be determined from a composite sample

(*a*) in the manner described in the publication *"Methods for Chemical Analysis of Waters and Wastewaters"*, published by the Department of the Environment; or

(*b*) by any other method the results of which can be confirmed by the method referred to in paragraph (*a*).

(2) The composite sample referred to in subsection (1) shall be

(*a*) in the case of treatment systems working continuously, the quantity of liquid effluent that is collected continuously during the sampling period and that is in proportion to the rate of flow of the effluent; and

(*b*) in the case of treatment systems working in batches, the quantity of liquid effluent that is collected by means of three grab samples one of which is taken at the beginning, one at the middle and one at the end of the treatment.

Records

6. (1) Every owner or person in charge of a plant that, pursuant to subsection 4(1), deposits mercury shall, in respect of that plant

(*a*) keep records in the form set out in Schedule A showing for each month

(i) the total quantity of mercury purchased for any purpose,

(ii) the use and other disposal of mercury purchased, and

(iii) the total quantity of metalic mercury stored; and

(*b*) keep records in the form set out in Schedule B showing for each day

(i) the total quantity of mercury in each kind of liquid effluent, determined in the manner referred to in section 5,

(ii) the quantity of chlorine produced,

(iii) the concentration of mercury in each kind of liquid effluent determined in the manner referred to in section 5, and

(iv) the quantity of each kind of liquid effluent discharged.

(2) A copy of the records referred to in paragraphs (1)(*a*) and (*b*) shall be signed as indicated in Schedules A and B and forwarded to the Minister.

Dépôts autorisés

4. (1) Sous réserve des dispositions de l'article 5, le mercure présent dans l'effluent d'une fabrique peut être déposé dans des eaux poissonneuses si la quantité déposée par la fabrique en un jour ne dépasse pas .005 livre par tonne de chlore produite par la fabrique ce jour-là.

(2) Le paragraphe (1) ne s'applique que soixante jours après l'entrée en vigueur du présent règlement.

Échantillonnage et analyse

5. (1) Aux fins de l'application du paragraphe 4(1), la quantité de mercure que contient l'effluent provenant d'une fabrique est mesurée à partir d'un échantillon moyen

a) selon la méthode indiquée dans la publication *Methods for Chemical Analysis of Waters and Wastewaters* du ministère de l'Environnement; ou

b) selon toute autre méthode, pourvu que les résultats puissent être confirmés par la méthode dont il est question à l'alinéa *a*).

(2) L'échantillon moyen dont il est fait mention au paragraphe (1) doit être

a) dans le cas des systèmes de traitement continu, la quantité d'effluent prélevée continuellement pendant la période d'échantillonnage et qui est proportionnelle au débit de l'effluent; et

b) dans le cas des systèmes de traitement discontinu, la quantité d'effluent prélevée au cours de trois échantillonnages instantanés effectués au commencement, au milieu et à la fin du traitement.

Registres

6. (1) Le propriétaire ou le responsable d'une fabrique qui, en vertu des dispositions du paragraphe 4(1), dépose du mercure doit, à l'égard de cette fabrique,

a) tenir, en la forme prescrite à l'annexe A, des registres où seront consignées, pour chaque mois,

(i) la quantité totale de mercure achetée à toute fin,

(ii) la quantité de mercure achetée qui a été employée ou rejetée, et

(iii) la quantité totale de mercure métallique entreposée; et

b) tenir, en la forme prescrite à l'annexe B, des registres où seront consignées, pour chaque jour,

(i) la quantité totale de mercure que contient chaque sorte d'effluent, mesurée selon la méthode mentionnée à l'article 5,

(ii) la quantité de chlore produite,

(iii) la concentration de mercure dans chaque sorte d'effluent, mesurée selon la méthode mentionnée à l'article 5, et

(iv) la quantité de chaque sorte d'effluent déversée.

(2) Une copie des registres dont il est question aux alinéas (1)*a*) et *b*) doit être signée, comme l'indiquent les annexes A et B, et expédiée au Ministre.

SCHEDULE A

MERCURY PURCHASED, USED, DISPOSED OF AND STORED

During the Month of ..... 19.....

Company name .....

Address ..... Phone .....

1. Total Mercury purchased for any purpose ..... pounds

2. Mercury used and disposed of
   (a) mercury deposited with liquid effluents ..... pounds
   (b) mercury in the caustic soda produced after final filtration (if applicable) ..... "
   (c) mercury disposed of with brine sludges ..... "
   (d) others ..... "
   ..... "
   ..... "
   ..... "
   ..... "
   ..... "

   Total mercury used or disposed of ..... pounds

3. Total mercury stored
   (a) at the beginning of the month ..... pounds
   (b) at the end of the month ..... pounds

I hereby certify that the statements and quantities listed above are correct to the best of my knowledge and belief.

.....
Signature of the Responsible Officer of the Company

ANNEXE A

MERCURE ACHETÉ, EMPLOYÉ, REJETÉ ET ENTREPOSÉ

Au cours du mois de ..... 19.....

Nom de la société .....

Adresse ..... Téléphone .....

1. Quantité totale de mercure acheté à toute fin ..... livres

2. Mercure employé ou rejeté
   a) mercure présent dans les effluents déposés ..... livres
   b) mercure présent dans la soude caustique produite, après filtration finale (s'il y a lieu) ..... "
   c) mercure rejeté avec les boues de saumure ..... "
   d) autres ..... "
   ..... "
   ..... "
   ..... "
   ..... "
   ..... "

   Quantité totale de mercure employé ou rejeté ..... livres

3. Quantité totale de mercure entreposé
   a) au début du mois ..... livres
   b) à la fin du mois ..... livres

Je certifie par les présentes que les renseignements donnés ci-dessus sont exacts et ont été donnés au mieux de mes connaissances et croyance.

.....
Signature du responsable de la société

SCHEDULE B

Daily record of mercury deposited, chlorine produced, concentration of mercury and quantity of liquid effluent for the month of ..... 19.....

	Effluent(s)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Avg.
1. Total amount of mercury in liquid effluent deposited (in pounds per day)																																	
Space reserved to EPS*																																	
2. Chlorine produced in Tons per day																																	
3. Pounds of mercury per Ton of Chlorine per day																																	
	Effluent(s)																																
4. Concentration of mercury in the liquid effluent (in ppm)**																																	
Space reserved to EPS*																																	
	Effluent(s)																																
5. Quantity of liquid effluent discharged (in Imp Gals per day)																																	
Space reserved to EPS*																																	

*EPS means Environmental Protection Service of the Department of the Environment
**ppm means parts per million.

I hereby certify that the information provided herein is correct to the best of my knowledge and belief.

....
Signature of the Responsible Officer of the Company

ANNEXE B

Relevé quotidien de la quantité de mercure déposé, de la production de chlore, de la concentration de mercure et de la quantité d'effluent, pour le mois de 19

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Moyenne
1. Quantité totale de mercure dans l'effluent déposé (liv./jour)	Effluent(s)																																
Espace réservé au SPE*																																	
2. Production de chlore en tonnes/jour																																	
3. Livres de mercure/tonne de chlore/jour																																	
4. Concentration de mercure dans l'effluent (en p.p.m.)**	Effluent(s)																																
Espace réservé au SPE*																																	
5. Quantité d'effluent déversé (en gallons impériaux/jour)	Effluent(s)																																
Espace réservé au SPE*																																	

*SPE signifie Service de protection de l'environnement du ministère de l'Environnement.
**p.p.m. signifie parties par million.

Je certifie par les présentes que les renseignements consignés ci-dessus sont exacts et ont été donnés au mieux de mes connaissances et croyance.

Signature du responsable de la société

QUEEN'S PRINTER FOR CANADA, OTTAWA, 1972
IMPRIMEUR DE LA REINE POUR LE CANADA, OTTAWA, 1972

Environment Canada

Environnement Canada

Environmental Protection

Protection de l'environnement

Pulp and Paper Effluent Regulations

Règlement sur les effluents des fabriques de pâtes et papiers

Regulations, Codes and Protocols Report 1

Water Pollution Control Directorate November 1971

Règlements, codes et accords Rapport 1

Direction générale de la lutte contre la pollution des eaux novembre 1971

SOR/71-578

FISHERIES ACT

Pulp and Paper Effluent Regulations

P.C. 1971-2281

2 November, 1971

His Excellency the Governor General in Council, on the recommendation of the Minister of the Environment, pursuant to sections 33 and 34 of the Fisheries Act, is pleased hereby to make the annexed Regulations Respecting Deleterious Substances in the form of Effluent from Pulp and Paper Mills.

REGULATIONS RESPECTING DELETERIOUS SUBSTANCES IN THE FORM OF EFFLUENT FROM PULP AND PAPER MILLS

Short Title

1. These Regulations may be cited as the *Pulp and Paper Effluent Regulations.*

Interpretation

2. (1) In these Regulations,

"Act" means the *Fisheries Act;*

"altered mill" means any mill the processes of which are, after the coming into force of these Regulations, altered, thereby resulting in a change in the quality of the effluent from the mill but does not include any mill the processes of which are altered solely for the purpose of pollution abatement;

"bio-chemical oxygen demand", or "BOD" means the number of pounds of dissolved oxygen required to stabilize, by biochemical action during an incubation period of five days at twenty degrees centigrade, the oxygen-demanding decomposible organic matter produced as waste from the production of one ton of pulp or paper;

"component process category" means a basic unit of processing in the operations of a mill;

"composite sample" means the contents of a receptacle into which samples of effluent from a mill have been delivered by a sampling device;

"Department" means the Department of the Environment;

"expanded mill' means any existing mill in which, after the coming into force of these Regulations, equipment has been installed that increases the production of the mill by ten per cent or more;

"existing mill" means any mill other than a new mill, expanded mill, or altered mill;

"mill" means a factory that produces pulp, paper, paperboard, hardboard, insulating and building board or any combination thereof;

"Minister" means the Minister of the Environment;

DORS/71-578

LOI SUR LES PÊCHERIES

Règlement sur les effluents des fabriques de pâtes et papiers

C.P. 1971-2281

2 novembre 1971

Sur avis conforme du ministre de l'Environnement et en vertu des articles 33 et 34 de la Loi sur les pêcheries, il plaît à Son Excellence le Gouverneur général en conseil d'établir le Règlement concernant les substances nocives présentes dans les effluents des fabriques de pâtes et papiers, ci-après.

RÈGLEMENT CONCERNANT LES SUBSTANCES NOCIVES PRÉSENTES DANS LES EFFLUENTS DES FABRIQUES DE PÂTES ET PAPIERS

Titre abrégé

1. Le présent règlement peut être cité sous le titre: *Règlement sur les effluents des fabriques de pâtes et papiers.*

Interprétation

2. (1) Dans le présent règlement,

«demande biochimique d'oxygène» ou «DBO», désigne le nombre de livres d'oxygène dissous nécessaire pour stabiliser par une action biochimique au cours d'une période d'incubation de cinq jours à 20 degrés centigrade les déchets de matières organiques décomposables par oxygénation résultant de la production d'une tonne de pâte ou de papier;

«échantillon composite» désigne le contenu d'un récipient dans lequel un échantillonneur a déversé des échantillons d'effluent;

«élément de transformation» désigne un élément fondamental de transformation parmi les opérations d'une fabrique;

«fabrique» désigne une fabrique qui produit de la pâte, du papier, du carton, des panneaux durs, des panneaux isolants et des panneaux de construction ou plusieurs de ces produits;

«fabrique à capacité accrue» désigne une fabrique existante dans laquelle un équipement qui accroît la production de dix pour cent ou plus a été installé après l'entrée en vigueur du présent règlement;

«fabrique existante» désigne une autre fabrique qu'une fabrique nouvelle, une fabrique à capacité accrue ou une fabrique modifiée;

«fabrique modifiée» désigne une fabrique dont les procédés de transformation sont modifiés après l'entrée en vigueur du présent règlement, ce qui produit un changement dans la qualité de l'effluent de la fabrique, mais ne comprend aucune fabrique dont les procédés de transformation sont modifiés uniquement pour diminuer la pollution;

"new mill" means any mill that commences operations after the coming into force of these Regulations;

"pulp yield" means the number of pounds of oven-dry pulp obtained from one hundred pounds of oven-dry wood fed to a digester, conventional stone grinder, refiner or other processing unit that converts wood to pulp;

"total suspended solids" means the filtered and dried residue present in the waste resulting from the processes involved in the operations of a mill.

(2) For the purposes of these Regulations, the quantity of BOD resulting from, and the quantity of total suspended solids contained in, the effluent from any mill shall be determined

(*a*) by the methods described for industrial wastes in the publication "Standard Methods for the Examination of Water and Wastewater" published jointly by the American Public Health Association, American Water Works Association and Water Pollution Control Federation, or

(*b*) by methods approved in writing by the Minister.

Deleterious Substances Prescribed

3. (1) For the purposes of paragraphs (*c*) and (*d*) of the definition "deleterious substance" in subsection 33(11) of the Act, the following are hereby prescribed as deleterious substances:

(*a*) total suspended solids;

(*b*) oxygen-demanding decomposible organic matter produced as waste from a mill;

(*c*) toxic wastes deposited by a mill.

(2) For the purposes of paragraph (1)(*c*) "toxic waste" is any waste that is found to be toxic when tested in the manner described in Schedule D.

4. (1) Subject to section 5, deleterious substances of the type and quantity described in the following paragraphs may be deposited from a mill in waters frequented by fish:

(*a*) total suspended solids contained in the effluent from any mill described in the heading of Column II, III, IV, or V of Schedule A where the number of pounds of those solids deposited by that mill does not exceed in any day the aggregate of the quantities obtained by multiplying

(i) the number of tons of wood processed or tons of product produced, as the case may be, by that mill in that day by each component process category set out in Column I of that Schedule, that is included in the operations of that mill

by

(ii) the number set out opposite that component process category in Column II, III, IV or V of that Schedule, whichever is applicable;

(*b*) total suspended solids contained in the effluent from any mill not described in Schedule A not exceeding in any day,

(i) in the case of a hardboard mill, fifteen pounds for each ton of product as produced by that mill in that day;

(ii) in the case of an insulating and building board mill, eight pounds for each ton of product as produced by that mill in that day; and

«fabrique nouvelle» désigne une fabrique dont l'exploitation commence après l'entrée en vigueur du présent règlement;

«Loi» désigne la *Loi sur les pêcheries*;

«Ministère» désigne le ministère de l'Environnement;

«Ministre» désigne le ministre de l'Environnement;

«rendement en pâte» désigne le nombre de livres de pâte (sec absolu) provenant de cent livres de bois (sec absolu) dont ont été alimentés un lessiveur, un défibreur classique, une raffineuse ou un autre élément qui transforme le bois en pâte; et

«solides en suspension de toute nature» désigne le résidu filtré et séché, présent dans les déchets d'exploitation d'une fabrique.

(2) Aux fins de l'application du présent règlement, la quantité de DBO de l'effluent d'une fabrique et la quantité de solides en suspension de toute nature qu'il contient doivent être établies

a) suivant les méthodes décrites relativement aux déchets industriels dans la publication intitulée *Standard Methods for the Examination of Water and Wastewater* publiée conjointement par l'*American Public Health Association*, l'*American Water Works Association* et la *Water Pollution Control Federation*, ou

b) suivant des méthodes approuvées par écrit par le Ministre.

Substances nocives désignées

3. (1) Aux fins des alinéas *c*) et *d*) de la définition de l'expression «substances nocives» donnée au paragraphe 33(11) de la Loi, les substances ci-après sont désignées comme étant nocives:

a) les solides en suspension de toute nature;

b) les déchets de matières organiques décomposables par oxygénation provenant d'une fabrique;

c) les déchets toxiques déposés par une fabrique.

(2) Aux fins de l'alinéa (1)*c*), l'expression «déchets toxiques» désigne des déchets dont la toxicité est établie par un essai effectué de la manière prescrite à l'annexe D.

4. (1) Sous réserve de l'article 5, des substances nocives d'une sorte et en une quantité décrites dans les alinéas ci-après peuvent être déposées par une fabrique dans les eaux poissonneuses:

a) des solides en suspension de toute nature présents dans l'effluent d'une fabrique désignée dans les rubriques des colonnes II, III, IV ou V de l'annexe A, lorsque le nombre de livres de ces solides que dépose la fabrique en un jour ne dépasse pas le chiffre total des quantités obtenues en multipliant

(i) le nombre de tonnes de bois transformé ou de tonnes de produit fabriqué, selon le cas, par cette fabrique ce jour-là, au cours de chacun des éléments de transformation indiqués dans la colonne I de cette annexe et qui font partie des opérations de cette fabrique;

par

(ii) le nombre indiqué vis-à-vis de l'élément de transformation dans la colonne II, III, IV ou V de cette annexe, selon le cas:

b) des solides en suspension de toute nature présents dans l'effluent d'une fabrique non désignée dans l'annexe A, lorsque le nombre de livres de ces solides ne dépasse pas en un jour

(i) dans le cas d'une fabrique de panneaux durs, quinze livres par tonne de produit fabriqué par cette fabrique ce jour-là;

(iii) in the case of a dissolving grade sulphite mill, thirty pounds for each air-dry ton of product produced by that mill in that day after pulping, bleaching and sheet formation;

(*c*) oxygen-demanding decomposible organic matter contained in the effluent from any mill described in the heading of Column II or III of Schedule B where the number of pounds of BOD resulting from the deposit does not exceed in any day the aggregate of the quantities obtained by multiplying:

(i) the number of air-dry tons of products produced by that mill in any such day from each type of process described in Column I of the Schedule that is included in the operations of that mill

by

(ii) the number set out opposite that process in Column II or III of the Schedule, whichever is applicable;

(*d*) an amount of oxygen-demanding decomposible organic matter contained in the effluent from any dissolving grade sulphite mill not described in Schedule B where the number of pounds of BOD resulting from the deposit does not exceed in any day, five hundred and eighty pounds for each air-dry ton of product produced.

(2) For the purpose of subsection (1), any portion of an expanded or altered mill that is not changed by expansion or alteration shall be regarded as an existing mill.

(3) For the purpose of calculating the tons of product referred to in Schedules A and B, mill screenings are not taken into account.

(4) For the purpose of calculating the quantity of total suspended solids and decomposible organic matter referred to in subsection (1), one hundred pounds of air-dry pulp shall be considered to be equal to ninety pounds of oven-dry pulp.

(5) The terms used in Schedules A and B are defined in Schedule C.

5. (1) The operator of every mill that, pursuant to section 4, deposits deleterious substances in waters frequented by fish, shall measure the effluent flow and the amount of total suspended solids and oxygen-demanding decomposible organic matter in composite samples of its effluent.

(2) The samples referred to in subsection (1) shall be obtained at all outfalls and measured at times and in the manner specified in Schedule E.

(3) The operator of every mill referred to in section 4 shall make and keep in his files records of the measurements made pursuant to subsection (1), the pulp yield and the daily production of the products from each process of that mill, and such other information as will enable the Minister to determine whether the quantity of any deleterious substance deposited by that mill in any day is in excess of the quantity authorized by that section.

6. These Regulations shall apply to each mill of the class described in Column I of an item of Schedule F on and after the day set out in Column II of that item.

(ii) dans le cas d'une fabrique de panneaux isolants et de panneaux de construction, huit livres par tonne de produit fabriqué par cette fabrique ce jour-là; et

(iii) dans le cas d'une fabrique de pâte au bisulfite à dissoudre, trente livres par tonne de produit (sec à l'air) fabriqué par cette fabrique ce jour-là après la cuisson, le blanchiment et la transformation de la pâte en feuille;

c) des matières organiques décomposables par oxygénation et présentes dans l'effluent d'une fabrique désignée dans la rubrique de la colonne II ou III de l'annexe B, lorsque le nombre de livres de DBO provenant du dépôt ne dépasse pas en un jour le chiffre total des quantités obtenues en multipliant

(i) le nombre de tonnes de produit (sec à l'air) fabriqué par cette fabrique en un jour et obtenu au moyen de chacun des genres de procédés établis à la colonne I de l'annexe et compris dans les opérations de cette fabrique

par

(ii) le nombre indiqué vis-à-vis du procédé dans la colonne II ou III de l'annexe, selon le cas;

d) une quantité de matières organiques décomposables par oxygénation et présentes dans l'effluent d'une fabrique de pâte au bisulfite à dissoudre non visée par l'annexe B, lorsque le nombre de livres de DBO, provenant du dépôt ne dépasse pas en un jour cinq cent quatre-vingts livres par tonne de produit (sec à l'air) fabriqué.

(2) Aux fins du paragraphe (1), une partie d'une fabrique à capacité accrue ou d'une fabrique modifiée que la capacité accrue ou la modification n'a pas changé est censée être une fabrique existante.

(3) Dans le calcul du nombre de tonnes de produit mentionné aux annexes A et B, il n'est pas tenu compte des refus d'épuration.

(4) Dans le calcul de la quantité de solides en suspension dont il est question au paragraphe (1), cent livres de pâte (sec à l'air) sont censées être l'équivalent de quatre-vingt-dix livres de pâte (sec absolu).

(5) Les expressions employées dans les annexes A et B sont définies à l'annexe C.

5. (1) L'exploitant d'une fabrique qui, en vertu de l'article 4, dépose des substances nocives dans des eaux poissonneuses doit mesurer le débit d'effluent de sa fabrique ainsi que la quantité de solides en suspension de toute nature et de matières organiques décomposables par oxygénation que contiennent les échantillons composites de l'effluent de sa fabrique.

(2) Les échantillons dont il est question au paragraphe (1) doivent être obtenus à tous les points de rejet et mesurés aux moments et de la manière spécifiés à l'annexe E.

(3) L'exploitant d'une fabrique dont il est question à l'article 4 doit tenir et garder dans ses dossiers des registres où seront inscrits les mesures établies conformément au paragraphe (1), le rendement en pâte et la production journalière obtenue au moyen de chaque procédé utilisé dans la fabrique, et tous les autres renseignements qui permettront au Ministre de décider si la quantité d'une substance nocive déposée par ces fabriques en un jour dépasse la quantité autorisée par cet article.

6. Le présent règlement s'applique à toutes les fabriques de la catégorie désignée à l'un des articles de l'annexe F, dans la colonne I, et à compter de la date fixée dans la colonne II de l'annexe.

SCHEDULE A

PERMITTED DEPOSITS OF TOTAL SUSPENDED SOLIDS IN THE EFFLUENT OF MILLS IN POUNDS PER TON*

Column I	Column II	Column III	Column IV	Column V
Component Process Category	Existing Kraft, Sulphite or Semi-chemical Mill	New, Expanded or Altered Kraft, Sulphite or Semi-chemical Mill	Existing Mechanical Mill	New, Expanded or Altered Mechanical Mill
1. Wood rewashing	5	5	5	5
2. Debarking Hydraulic Process	5	5	5	5
3. Debarking Wet Drum Process	10	8	10	8
4. Pulping	7	5	13	10
5. Bleaching	6	4	2	2
6. Pulp Sheet Formation	2	1	5	4
7. Integrated, Single Product Paper Making	3	2	5	4
8. Integrated, Specialty, Single-product Paper Making	6	4	10	8
9. Tissue Paper Making	15	10	20	15
10. Fine and Specialty Multi-product Paper Making	25	20	25	20
11. Cylinder Paper or Paperboard Manufacture	15	12	15	12
12. Neutral Sulphite Semi-chemical Corrugating Medium	7	7		

*"ton" means, in respect of a component process category in
(*a*) items 1 to 3, an oven-dry ton of wood processed without the bark,
(*b*) items 4 to 6, an air-dry ton of product, and
(*c*) items 7 to 12, a ton of product as produced.

ANNEXE A

DÉPÔTS PERMIS DE SOLIDES EN SUSPENSION DE TOUTE NATURE DANS L'EFFLUENT D'UNE FABRIQUE, EXPRIMÉS EN LIVRES PAR TONNE*

Colonne I	Colonne II	Colonne III	Colonne IV	Colonne V
Éléments de transformation	Fabrique existante de pâte kraft, de pâte au bisulfite ou de pâte mi-chimique	Fabrique nouvelle, à capacité accrue ou modifiée de pâte kraft, de pâte au bisulfite ou de pâte mi-chimique	Fabrique existante de pâte mécanique	Fabrique nouvelle, modifiée ou à capacité accrue de pâte mécanique
1. Lavage du bois	5	5	5	5
2. Écorçage—procédé hydraulique	5	5	5	5
3. Écorçage au tambour—procédé humide	10	8	10	8
4. Cuisson	7	5	13	10
5. Blanchiment	6	4	2	2
6. Transformation de la pâte en feuille	2	1	5	4
7. Fabrication intégrée d'un seul produit de papier	3	2	5	4
8. Fabrication intégrée d'un seul produit de papier à usages spéciaux	6	4	10	8
9. Fabrication de papier mousseline	15	10	20	15
10. Fabrication de papiers fins et de papiers à usages spéciaux	25	20	25	20
11. Fabrication de papier ou de carton au moyen d'une machine de forme ronde	15	12	15	12
12. Fabrication de pâte mi-chimique au sulfite neutre pour carton à onduler	7	7		

*«tonne» désigne, pour ce qui concerne un élément de transformation mentionné
a) aux articles 1 à 3, une tonne de bois écorcé transformé (sec absolu)
b) aux articles 4 à 6, une tonne de produit (sec à l'air), et
c) aux articles 7 à 12, une tonne de produit fabriqué.

SCHEDULE B

PERMITTED DEPOSITS OF OXYGEN-DEMANDING DECOMPOSIBLE ORGANIC MATTER IN POUNDS OF BOD PER AIR-DRY TON OF PRODUCT

Column I	Column II	Column III
Type of Process	Existing Mill	New, Altered and Expanded Mill
Sulphite pulping yield of 55% or less	255	170
Sulphite pulping yield of more than 55% and less than 65%	170	115
Sulphite pulping yield of 65% or more	150	75
Sulphite bleaching (market pulp)	35	35
Kraft pulping	64	33
Kraft bleaching	27	27
Neutral Sulphite Semi-Chemical pulping	80	60

ANNEXE B

DÉPÔTS PERMIS DE MATIÈRES ORGANIQUES DÉCOMPOSABLES PAR OXYGÉNATION EN LIVRES DE DBO PAR TONNE DE PRODUIT SEC À L'AIR

Colonne I	Colonne II	Colonne III
Genre de procédé	Fabrique existante	Fabrique nouvelle, modifiée ou à capacité accrue
Cuisson au bisulfite—rendement d'au plus 55%	255	170
Cuisson au bisulfite—rendement de plus de 55% et de moins de 65%	170	115
Cuisson au bisulfite—rendement de 65% ou plus	150	75
Blanchiment au bisulfite (pâte marchande)	35	35
Cuisson de la pâte kraft	64	33
Blanchiment de la pâte kraft	27	27
Cuisson de la pâte mi-chimique au sulfite neutre	80	60

SCHEDULE C

DEFINITIONS OF TERMS

1 For the purposes of Schedules A and B,

"bleaching" means all operations concerned with the chemical treatment of pulp for the purpose of improving pulp brightness, and includes washing and screening the pulp as far as the processes of sheet formation, paper making or machine drying;

"cylinder paper or paperboard manufacture" means operations resulting in the production of paper or paperboard on a cylinder board machine which operations are not regarded as integrated with the production of pulp;

"debarking—hydraulic process" means removing bark from logs or slabs of wood by means of high pressure water sprays;

"debarking– wet drum process" means removing bark from whole logs or sections of logs by tumbling the logs against each other and against the inner wall of a rotating perforated drum equipped with water sprays to wash out particles of bark that are dislodged from the logs in passing through the drum;

"fine and specialty multiproduct paper making" means operations

(*a*) that result in the production of many grades of paper, and are not regarded as integrated with the production of pulp,

(*b*) in which the grades and types of paper are frequently changed with varying additions of dyes, clays, fillers, starch, resins or glue to the paper stock, so that continuous recirculations of water from paper making operations is impossible, and

(*c*) in which the sheet normally is formed on a Fourdrinier machine or a machine operating on a similar principle;

"integrated, single-product paper making" means that

(*a*) pulp and paper are manufactured concurrently by the same mill,

(*b*) recirculations of water from the paper making operation are possible within the paper making or pulp making operations, and

(*c*) the sheet normally is formed on a Fourdrinier machine or a machine operating on a similar principle;

"integrated, specialty, single-product paper making" means that

(*a*) pulp and paper are manufactured concurrently by the same mill,

(*b*) additives such as clay, glue or starch are normally added to the paper stock so that recirculations of water from any paper making operation to the same paper making operation or to another pulp making or paper making operation is impossible, and

(*c*) the sheet normally is formed on a Fourdrinier machine or a machine operating on a similar principle;

"mechanical mill" means a mill having operations that convert wood to pulp by conventional stone grinders or refiners, which operations take place between the debarking of wood and the processes of sheet formation, wet lap formation, paper making or machine drying;

"neutral sulphite semichemical pulp" means a pulp normally used in the manufacture of paperboard;

ANNEXE C

DÉFINITIONS

1. Aux fins de l'application des annexes A et B,

«blanchiment» désigne toutes les opérations ayant trait au traitement chimique de la pâte, pour améliorer la brillance de la pâte, et comprend le lavage et le tamisage de la pâte jusqu'à la transformation de la pâte en feuille, la fabrication du papier ou le séchage à la machine;

«cuisson» dans le cas des fabriques de pâte kraft, de pâte au bisulfite et de pâte mi-chimique au sulfite neutre, comprend toutes les opérations intermédiaires entre la sortie du lessiveur et le dernier traitement de la pâte avant le blanchiment, la transformation de la pâte en feuille ou la fabrication du papier;

«écorçage—procédé hydraulique» désigne l'action de dépouiller de l'écorce des billes ou des dosses au moyen de jets d'eau à haute pression;

«écorçage au tambour—procédé humide» désigne l'action de dépouiller de l'écorce des billes entières ou sections de billes par le frottement des billes entre elles et contre les parois d'un tambour rotatif perforé et muni de jets d'eau afin d'éliminer les particules d'écorce détachées des billes pendant le traitement;

«fabrication de papier mousseline» désigne une opération

a) qui aboutit à la fabrication du papier mousseline, du papier à démaquiller, du papier hygiénique et du papier à serviettes, et qui n'est pas censée être intégrée à la production de la pâte, et

b) par laquelle la feuille de papier mousseline est ordinairement formée sur une machine à papier Yankee ou sur une machine qui utilise un principe analogue;

«fabrication de papier ou de carton au moyen d'une machine de forme ronde» désigne les opérations aboutissant à la fabrication de papier ou de carton sur une machine de forme ronde, opérations qui ne sont pas censées être intégrées à la fabrication de la pâte;

«fabrication de papiers fins et de papiers à usages spéciaux» désigne des opérations

a) qui aboutissent à la production de maintes qualités de papier et ne sont pas censées être intégrées à la fabrication de la pâte,

b) par lesquelles les qualités et les sortes de papiers sont souvent changées par l'addition de teintures, d'argile, de charges, d'amidon, de résines ou de colle à la pâte de papier, de sorte que le recyclage continu de l'eau ayant servi aux opérations de fabrication du papier est impossible, et

c) par lesquelles la feuille de papier est ordinairement formée sur une machine Fourdrinier ou une machine qui utilise un principe analogue;

«fabrication intégrée d'un seul produit de papier» signifie

a) que la pâte et le papier sont fabriqués concurremment par la même fabrique,

b) que le recyclage de l'eau ayant servi à l'opération de fabrication du papier est possible pour la fabrication du papier ou de la pâte, et

c) que la feuille est ordinairement formée sur une machine Fourdrinier ou sur une machine qui utilise un principe analogue;

«fabrication intégrée d'un seul produit de papier à usages spéciaux» signifie

a) que la pâte et le papier sont fabriqués concurremment par la même fabrique,

"pulp sheet formation" includes all those operations following pulping or bleaching that involve the formation of wet lap or a dried sheet;

"pulping" in the case of kraft, sulphite and neutral sulphite chemical mills includes all operations between the digester outlet and the final processing of the stock prior to bleaching, sheet formation or paper making;

"tissue paper making" means an operation

(*a*) that results in the production of tissue paper, facial tissue, toilet paper and paper towelling, which operation is not considered to be integrated with the production of pulp, and

(*b*) in which the tissue paper sheet is normally formed on a Yankee paper machine or a machine operating on a similar principle;

"wood rewashing" means removing adhering wood or bark particles, soil, sand or mud from barked or unbarked logs by spraying them with water prior to their use in the mill.

b) que des additifs comme l'argile, la colle ou l'amidon sont ordinairement ajoutés à la pâte de papier de sorte que le recyclage de l'eau ayant servi à une opération de fabrication de papier n'est pas possible pour la même opération de fabrication ni pour une autre opération de fabrication de pâte ou de papier, et

c) que la feuille est ordinairement formée sur une machine Fourdrinier ou une machine qui utilise un principe analogue;

«fabrique de pâte mécanique» désigne une fabrique qui comporte des opérations par lesquelles elle transforme le bois en pâte au moyen de défibreurs classiques ou de raffineuses, s'agissant d'opérations intermédiaires entre l'écorçage du bois et les procédés de transformation de la pâte en feuille, de formation de la pâte en liasse, de fabrication du papier ou de séchage à la machine;

«lavage du bois» désigne l'action d'enlever les particules de bois ou d'écorce, de terre, de sable ou de boue qui adhèrent aux billes écorcées ou non en les arrosant avec de l'eau avant leur emploi dans la fabrique;

«pâte mi-chimique au sulfite neutre» s'entend d'une pâte employée ordinairement dans la fabrication de carton; et

«transformation de la pâte en feuille» comprend toutes les opérations qui suivent la cuisson ou le blanchiment et qui comportent la formation de la pâte en liasse ou d'une feuille séchée.

SCHEDULE D

TEST FOR DETERMINING TOXICITY OF MILL EFFLUENT

1. The sample of mill effluent to be tested shall be maintained at a temperature not exceeding 8°C from the time that it is taken until the time of the test.

2. For the test, two tanks equal in size are to be used.

3. The liquid in one tank shall be a mixture of 65 per cent effluent and 35 per cent water, the latter being taken from the same water supply that is being used to hold fish to be used in the test.

4. The liquid in the other tank shall consist entirely of water taken from the same water supply as that being used to hold fish to be used in the test.

5. While the test is being conducted

(*a*) the liquid in each tank shall be continuously aerated, and

(*b*) the liquid in each tank shall be replaced continuously at a constant rate by fresh water or fresh effluent mixture as the case may be.

6. An equal number of fish that appear to be healthy and that are of a species that frequent the waters into which the mill effluent is being discharged shall be placed in each tank and kept there for a period of 96 hours.

7. If any of the fish in the tank that does not contain effluent fail to survive for the period of 96 hours, the test shall be repeated.

8. If all the fish in the tank that does not contain effluent survive for 96 hours and less than 80% of the fish in the tank that contains effluent survive for ninety-six hours, that effluent shall be regarded as toxic.

ANNEXE D

ESSAI DE TOXICITÉ D'UN EFFLUENT DE FABRIQUE

1. L'échantillon d'effluent de fabrique qui doit faire l'objet d'un essai doit être maintenu à une température d'au plus 8°C à partir du moment de son prélèvement jusqu'à celui de l'essai.

2. L'essai doit se faire à l'aide de deux réservoirs d'égale capacité.

3. L'un des réservoirs doit contenir un mélange de 65 pour cent d'effluent et de 35 pour cent d'eau, cette eau devant provenir de la même source d'approvisionnement que l'eau où est retenu le poisson qui doit servir à l'essai.

4. L'autre réservoir ne doit contenir que de l'eau provenant de la même source d'approvisionnement que celle où est retenu le poisson qui doit servir à l'essai.

5. Au cours de l'essai

a) le liquide que contient chaque réservoir doit être aéré continuellement, et

b) le liquide que contient chaque réservoir doit être remplacé continuellement à un rythme constant par de l'eau fraîche ou par un mélange d'effluent et d'eau, selon le cas.

6. Un nombre égal de poissons apparemment sains et d'une espèce qui fréquente les eaux où l'effluent de fabrique est déversé doivent être mis et gardés dans chaque réservoir durant 96 heures.

7. Si l'un des poissons mis dans le réservoir qui ne contient pas d'effluent ne survit pas 96 heures, l'essai doit être recommencé.

8. Si tous les poissons mis dans le réservoir qui ne contient pas d'effluent survivent 96 heures et que moins de 80 pour cent des poissons mis dans le réservoir qui contient de l'effluent survivent 96 heures, l'effluent est censé être toxique.

SCHEDULE E

1. (1) Except in the case of sewers entering into and discharging from a biological treatment system, every sewer from a mill having an outfall discharging into waters frequented by fish shall be equipped with a device that is so designed that each time a volume of effluent equal to one-twelfth of the average daily volume discharged has passed through that sewer a quantity of that effluent is delivered into a receptacle, the quantity delivered each time being the same.

(2) The operator of every mill that

(*a*) has a type of process set out in Column I of Schedule B, or

(*b*) is a dissolving grade sulphite mill

shall, every day that the mill is operating, measure the amount of BOD resulting from the effluent collected pursuant to subsection (1).

(3) The operator of every mill shall, every day that it is operating, measure the amount of total suspended solids in the effluent collected pursuant to subsection (1).

(4) The contents of the receptacle shall be held at a temperature not exceeding 8°C until the total suspended solids and BOD are measured.

2. (1) In the case of a mill having sewers entering into and discharging from a biological treatment system, every sewer entering the system shall be equipped with a device that is so designed that each time a volume of effluent equal to one-twelfth of the average daily volume discharged has passed through that sewer a quantity of that effluent is delivered into a receptacle, the quantity delivered each time being the same.

(2) On every day that the mill is operating, the amount of total suspended solids in the effluent collected in that receptacle shall be measured.

(3) The contents of the receptacle shall be held at a temperature not exceeding 8°C until the total suspended solids are measured.

3. (1) The amount of BOD in the effluent from a sewer discharging from a biological treatment system shall be measured in samples that have been taken from that sewer at regular intervals of twenty-four hours on every day that the mill is operating.

(2) The samples shall be filtered to remove biological solids and held at a temperature not exceeding 8°C until the BOD has been measured.

SCHEDULE F

DATE OF APPLICATION

Column I Class of Mills	Column II Date
1. New Mills	November 24, 1971
2. Expanded Mills	November 24, 1971
3. Altered Mills	November 24, 1971
4. Existing Mills	—

ANNEXE E

1. (1) Sauf dans le cas d'égouts raccordés à un système de traitement biologique, un égout de fabrique dont le point de rejet se trouve en eau poissonneuse doit être muni d'un dispositif conçu de telle manière que, chaque fois que l'égout déverse un douzième de la quantité moyenne qu'il déverse par jour, une quantité fixe d'effluent est déversée dans un récipient.

(2) L'exploitant d'une fabrique

a) qui utilise un genre de procédé indiqué dans la colonne I de l'annexe B, ou

b) qui est une fabrique de pâte au bisulfite à dissoudre,

doit, chaque jour d'exploitation de la fabrique, mesurer la quantité de DBO de l'effluent recueilli conformément au paragraphe (1).

(3) L'exploitant de chaque fabrique doit, chaque jour d'exploitation de la fabrique, mesurer la quantité de solides en suspension de toute nature que contient l'effluent recueilli conformément au paragraphe (1).

(4) Le contenu du récipient doit être maintenu à une température d'au plus 8°C jusqu'à ce que soient mesurés les solides en suspension de toute nature et le DBO.

2. (1) Dans le cas d'une fabrique dont les égouts sont raccordés à un système de traitement biologique, tous les égouts qui se déversent dans ce système doivent être munis d'un dispositif conçu de manière que, chaque fois que l'égout déverse un douzième de la quantité moyenne qu'il déverse par jour, une quantité fixe d'effluent est déversée dans un récipient.

(2) Chaque jour d'exploitation de la fabrique, la quantité de solides en suspension de toute nature que contient un échantillon recueilli dans ce récipient doit être mesurée.

(3) Le contenu du récipient doit être maintenu à une température d'au plus 8°C jusqu'à ce que soient mesurés les solides en suspension de toute nature.

3. (1) La quantité de DBO présente dans l'effluent que rejette l'égout d'un système de traitement biologique doit être mesurée dans les échantillons qui ont été prélevés de cet égout à intervalles réguliers de vingt-quatre heures chaque jour d'exploitation de la fabrique.

(2) Les échantillons doivent être filtrés de manière à enlever les matières solides biologiques et maintenus à une température d'au plus 8°C jusqu'à ce que le DBO ait été mesuré.

ANNEXE F

DATE D'APPLICATION

Colonne I Catégorie de fabriques	Colonne II Date
1. Fabriques nouvelles	24 novembre 1971
2. Fabriques à capacité accrue	24 novembre 1971
3. Fabriques modifiées	24 novembre 1971
4. Fabriques existantes	—

QUEEN'S PRINTER FOR CANADA, OTTAWA, 1971

IMPRIMEUR DE LA REINE POUR LE CANADA, OTTAWA, 1971

Environment Canada
Environmental Protection

Environnement Canada
Protection de l'environnement

Guidelines for the Pulp and Paper Effluent Regulations

Lignes directrices concernant le Règlement sur les effluents des fabriques de pâtes et papiers

Regulations, Codes and Protocols Report 2

Water Pollution Control Directorate
May, 1972

Règlements, codes et accords Rapport 2

Direction générale de la lutte contre la pollution des eaux
Mai, 1972

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GUIDELINES FOR THE PULP AND PAPER EFFLUENT REGULATIONS PROMULGATED UNDER THE FISHERIES ACT

The following explanations are intended to clarify the meaning, intent or basis of authority for the Regulations which are not always clear in the Regulations because of the difficulty of expressing technical concepts in legal terminology.

SECTION 2

In Section 2 which deals with the interpretation of legal terms and technical terms having legal significance, "new", "expanded", "altered" and "existing" mills are distinguished from one another by definition.

Plans required for new mills

The definition of a new mill is straightforward. As authorized by Subsection 33A(1) of the Fisheries Act, the Minister will require the submission of plans including those of treatment facilities which will require his approval before that mill may be constructed.

Plans required for altered mills

Subsection 33A(1) of the Act gives the Minister authority to request plans of a mill being altered. The definition of an altered mill is meant to include any mill in which some of the operations have been altered in order to produce a different final product or the same final product by different operations. In such cases the Minister will request plans, including plans of treatment facilities, and it is intended that the permitted deposits of Total Suspended Solids and BOD_5 from operations which have been altered shall not exceed those shown in Schedules A and B for new, altered or expanded mills. The permitted deposits of Total Suspended Solids and BOD_5 from operations which have not been altered will remain those shown in the same Schedules for existing mills.

Plans required for expanded mills

An expanded mill is regarded to be one in which it is intended to increase production of the same product, by more than an arbitrary amount; in this case 10 percent. The arbitrary figure of 10 percent was stipulated having in mind that new mills after startup can, by refinements in operating procedures, often exceed their

LIGNES DIRECTRICES CONCERNANT LE RÈGLEMENT SUR LES EFFLUENTS DES FABRIQUES DE PÂTES ET PAPIERS PROMULGUÉ EN VERTU DE LA LOI SUR LES PÊCHERIES.

Les explications suivantes ont pour but de préciser le sens, l'intention du règlement et l'autorité en vertu de laquelle il a été établi, points qui ne sont pas toujours très clairs à cause de la difficulté d'exprimer des idées techniques en termes juridiques.

ARTICLE 2

A l'article 2, où se trouve l'interprétation des termes juridiques et des termes techniques ayant une signification juridique, les fabriques "nouvelles", "à capacité accrue", "modifiées" et "existantes" sont, par définition, distinctes les unes des autres.

Soumission des plans des nouvelles fabriques

La définition d'une fabrique nouvelle est précise. Comme il est établi au paragraphe 33A(1) de la Loi sur les pêcheries, le Ministre exigera qu'on lui fournisse des plans, y compris les plans des installations de traitement, qui devront recevoir son approbation avant que la fabrique puisse être construite.

Soumission des plans des fabriques modifiées

Le paragraphe 33A(1) de la Loi autorise le Ministre à demander qu'on lui fournisse les plans d'une fabrique qu'on est en train de modifier. La définition d'une fabrique modifiée est censée comprendre toute fabrique dont certains procédés de transformation ont été changés de façon à donner un produit final différent ou le même produit final, mais par des opérations différentes. Dans ces cas, le Ministre demandera les plans, y compris ceux des installations de traitement, et l'administration projette d'interdire que les dépôts permis de solides en suspension de toute nature et de DBO_5 produits par les procédés modifiés ne dépassent pas ceux qui sont exprimés en livres par tonne aux annexes A et B et qui concernent les fabriques nouvelles, modifiées et à capacité accrue. Les dépôts permis de solides en suspension de toute nature et de DBO_5 produits par les procédés non modifiés resteront ceux qui sont exprimés en livres par tonne auxdites annexes et qui concernent les fabriques existantes.

Soumission des plans des fabriques à capacité accrue

Une fabrique à capacité accrue est censée être celle où l'on se propose d'augmenter la production du même produit d'une quantité supérieure à une mesure arbitraire, dans le cas présent, dix pour cent. On a prescrit ce chiffre arbitraire de dix pour cent en se basant sur le fait qu'après leur mise en activité les nouvelles fabriques

design production capacity, but seldom by more than 10 percent. The intention is to identify as expanded mills those in which new processing equipment will be installed for the express purpose of increasing production. In the case of expanded mills, the Minister will request plans of the expansion including those of treatment facilities.

peuvent, grâce à des améliorations apportées aux procédés de fabrication, dépasser la capacité de production prévue, mais rarement par plus de dix pour cent. Le but de cette précision est de pouvoir classer comme fabriques à capacité accrue celles dans lesquelles sera installé un équipement de transformation destiné d'une façon expresse à accroître la production. Dans le cas des fabriques à capacité accrue, le Ministre demandera qu'on lui fournisse les plans d'agrandissement, y compris ceux des installations de traitement.

Plans for existing mills should be submitted.

Subsection 33A(3) of the Act gives the Minister the authority to request information relating to the operation of any undertaking, which includes the operation of existing mills. If it is found that deleterious substances are being discharged in amounts exceeding the permitted deposits named in the Regulations, the Minister will require the provision of treatment facilities. While the authority to request plans of the treatment facilities for an existing mill is not present in Subsection 33A(1) it will obviously be necessary for the Minister to be provided with plans of the treatment facilities.

Le paragraphe 33A(3) de la Loi autorise le Ministre à demander des renseignements relatifs à l'exploitation de toute entreprise, ce qui comprend les fabriques existantes. Si l'on découvre que des substances nocives sont déversées en quantités supérieures aux dépôts permis dans ledit règlement, le Ministre exigera l'installation de systèmes de traitement. Bien que le paragraphe 33A(1) ne donne pas au Ministre l'autorisation de demander qu'on lui fournisse les plans des systèmes de traitement, il est évident qu'il sera nécessaire de les lui fournir.

Soumission des plans des fabriques existantes.

Component Process Categories or building blocks to determine overall permitted deposits of Total Suspended Solids

Broad groups of operations which are commonly employed in manufacturing pulp or paper have been named "Component Process Categories" in Column I of Schedule A. Because all mills must employ one or more of them they were created to serve as convenient "building blocks" which could be put together for the purpose of identifying the operations taking place in any mill. Having identified the Component Process Categories present in a mill, it is then possible by summing the units of Total Suspended Solids corresponding to each, to arrive at an overall permitted deposit for that mill. The units assigned to the Component Categories shown in Schedule A reflect the assumption that losses of Total Suspended Solids in the effluent from all mills will be reduced by the application of primary treatment to them. (Examples of the detailed method of calculation which should be followed to arrive at overall permitted losses are given in Appendix 1).

Les vastes ensembles d'opérations qui sont généralement employés dans la fabrication de pâtes ou de papiers ont été appelés "éléments de transformation" à la colonne I de l'annexe A. Parce que toute fabrique doit en utiliser un ou plusieurs, ils ont été créés pour servir de cubes pratiques de construction qu'on peut assembler afin de prendre connaissance des opérations d'une fabrique quelconque. Après l'identification des éléments de transformation d'une fabrique, il devient possible d'additionner les unités de solides en suspension de toute nature correspondant à chaque élément et d'en arriver ainsi au dépôt total permis pour cette fabrique. Les unités attribuées aux éléments de transformation et énumérées à l'annexe A reflètent la supposition qu'un traitement primaire des solides en suspension de toute nature en réduira le déversement dans l'effluent de toute fabrique. (L'appendice 1 donne des exemples détaillés de la méthode de calcul qui permet d'obtenir la quantité totale des déversements permis).

Éléments de transformation ou cubes de construction permettant de déterminer les dépôts totaux permis de solides en suspension de toute nature.

Methods other than Standard Methods may be used if approved by the Minister.

In Subsection (2)(b) of Section 2 it is stated that methods approved in writing by the Minister for determining Total Suspended Solids and BOD_5 may be used. This was inserted because of anticipated practical difficulties connected with the method which is given for industrial wastes in **Standard Methods for the Examination of Water and Wastewater** when these methods are used for pulp and paper wastes. Filtering effluents containing very small particles or gels may make filtration a very time-consuming procedure. For

L'alinéa 2(2)b) autorise l'utilisation de méthodes approuvées par écrit par le Ministre pour établir la quantité de solides en suspension de toute nature et la quantité de DBO_5. On a apporté cette précision à cause des difficultés d'ordre pratique que présentera peut-être l'application aux déchets de pâtes et de papiers de la méthode décrite relativement aux déchets industriels dans le **Standard Methods for the Examination of Water and Wastewater**. Le filtrage des effluents contenant des particules

D'autres méthodes d'analyses que les "standard methods" peuvent être employées si elles sont approuvées par le Ministre

mills having only one outfall and required by the Regulations to conduct one analysis per day, the time required for filtration should not be a substantial inconvenience. For other mills having many outfalls the determination of Total Suspended Solids on a "composite-composite" sample as described in these Guidelines for Section 5 of the Regulations will have the effect of greatly reducing the number of filtrations required. If a new method which gives equally accurate results can be found it will be welcomed and approved by the Minister. The shortcomings of the conventional BOD_5 test are well known. At present, no better method is available, but if a superior one is developed it will be approved.

minuscules ou des gels peut représenter un très long travail. Pour les fabriques munies d'un seul point de rejet et obligées en vertu du règlement à faire une analyse par jour, le temps nécessaire au filtrage ne devrait pas être un grave inconvénient. Pour les fabriques munies de nombreux points de rejet, la détermination des solides en suspension de toute nature contenus dans un mélange d'échantillons composites, tel qu'il est décrit dans les présentes lignes directrices relativement à l'article 5 du règlement, réduira de beaucoup le nombre des filtrages exigés. Le Ministre accueillera et approuvera toute nouvelle méthode qui pourra donner des résultats aussi justes que la méthode adoptée. Les défauts de l'analyse de DBO_5 sont bien connus. Pour l'instant, il n'existe pas de meilleure méthode, mais si un procédé supérieur venait à être mis au point il serait approuvé.

SECTION 3

ARTICLE 3

Deleterious Substances named

In this Section, Total Suspended Solids, oxygen-demanding decomposable organic matter and toxic wastes are named as deleterious substances, the discharge of which is prohibited under Subsection 33(2) of the Fisheries Act. Wastes from pulp and paper mills which fail to meet the conditions of survival of fish stipulated in Schedule D will be considered to be toxic wastes under the Act.

Substances nocives désignées

Dans cet article, les solides en suspension de toute nature, les déchets de matières organiques décomposables par oxygénation et les déchets toxiques sont appelés substances nocives et leur déversement est interdit en vertu du paragraphe 33(2) de la Loi sur les pêcheries. Si les déchets des fabriques de pâtes et papiers ne satisfont pas aux conditions de survie des poissons stipulées dans l'annexe D, ils seront considérés comme toxiques aux termes de la Loi.

Interpretation of Schedule D

It is anticipated as a result of ongoing studies that the toxicity regulation will eventually include only the naming of a standard species of fish for tests, a short description of the toxicity requirement and any necessary reference to the test procedure, and that detailed procedures pertaining to bioassay methods will be restricted to the Guidelines. As information appropriate to the application of more precise bioassay techniques is developed the Guidelines will be altered.

Interprétation de l'annexe D.

On s'attend que par suite des études en cours, le règlement sur la toxicité en arrivera à ne comprendre que le nom d'une espèce convenue de poisson qui devra servir aux essais, une brève description des exigences relatives à la toxicité et tout renvoi nécessaire à la méthode d'essai, et que les détails précis des méthodes d'essais biologiques soient conformes aux modalités prescrites. Ces dernières seront modifiées à mesure que l'on établira des données permettant d'élaborer des techniques d'essai biologique plus précises.

Intend of Schedule

The intent of Schedule D is to have mills comply to a standard toxicity requirement for fish. In addition, the practice of routine bioassay monitoring of effluents will apprise mill operators of gross malfunctioning of treatment systems.

Objet de l'annexe

L'annexe D a pour objet d'amener les fabriques à se conformer à une exigence uniforme relativement à la toxicité par rapport aux poissons. En outre, le contrôle courant des effluents au moyen d'essais biologiques, indiquera toute panne générale des dispositifs de traitement aux exploitants de la fabrique.

Replecated single concentration continuous flow tests for legal purposes

For legal purposes, it is recommended that continuous flow tests at 65 percent concentration be carried out, using 10 fish per test and an exposure period of 96 hours. There should be sufficient replications to establish whether the mean survival rate differs significantly from the 80 percent survival rate required by Schedule D. The application of Student's "t"

Redoublements des essais à débit continu à concentration unique à des fins de surveillance officielle.

On recommande, dans le cas d'essais officiels, que les essais à débit continu soient effectués à une concentration de 65 pour cent, à raison de dix poissons par essai sur une durée de 96 heures. Il doit y avoir assez de redoublements pour comparer le taux moyen de survie au taux de 80 pour cent que prévoit l'annexe D. On suggère que l'essai "t" de Student au niveau de probabilité de

test at the 95 percent probability level is suggested. Generally, one control accompanied by five simultaneous tests at 65 percent effluent concentration should provide sufficient replication.

95 pour cent soit appliqué. Aux fins de redoublement, un contrôle et cinq essais simultanés à une concentration d'effluent de 65 pour cent devraient être suffisants.

Single concentration continuous flow tests for non-legal monitoring

For non-legal, routine monitoring purposes it is recommended that mills forward to the regulatory agency sufficient effluent to conduct single concentration continuous flow tests in which 10 fish will be exposed for 96 hours to a mixture of 65 parts effluent diluted with 35 parts water. By limiting routine tests to a single concentration it should be possible to detect treatment malfunctions and at the same time keep the quantities of effluent required for testing manageably small (calculations showing the amounts of effluent required are given in Appendix II). Ten fish should be held in uncontaminated water under similar test conditions to those for fish exposed to the effluent mixture. An 80 percent survival rate or more in the effluent mixture accompanied by complete survival of controls should be regarded as a "pass".

Il est recommandé, dans le cas de surveillance courante à des fins non officielles, que les fabriques fassent parvenir une quantité suffisante d'effluent à l'organisme réglementaire pour que ce dernier puisse faire les essais à débit continu à concentration unique en vertu desquels on expose dix poissons à un mélange de 65 pour cent d'effluent et de 35 pour cent d'eau sur une période de 96 heures. Le fait de limiter les essais courants à une concentration unique devrait permettre de découvrir les arrêts de fonctionnement des dispositifs de traitement et en plus, de garder les effluents requis aux fins des essais à des quantités relativement petites (les calculs indiquant les quantités requises figurent à l'appendice II). Dix poissons doivent être gardés dans de l'eau qui ne contient pas d'effluent dans des conditions semblables à celles qui s'appliquent aux poissons exposés au mélange d'effluent. Si 80 pour cent des poissons ou plus survivent dans le mélange d'effluent ainsi que tous les poissons témoins on peut dire que l'effluent est "acceptable".

Essais à débit continu à concentration unique à des fins de surveillance non officielle.

Static tests optional for routine monitoring

For convenience, single concentration static tests conducted over a period of 96 hours at 65 percent effluent concentration may be used by a regulatory agency or by mills which desire to incorporate toxicity testing into a self-monitoring program. If static tests are conducted it is recommended that the solution be changed daily. As indicated by the calculations of Appendix II, the quantity of effluent required for a static test involving a daily change of solution is approximately one and a half times the quantity required for continuous flow tests so that there is no advantage to be gained from static tests by a regulatory agency concerned with the problems of shipping samples to a central testing laboratory. However, at any mill where an unlimited quantity of effluent would always be available, the simplicity of the apparatus required for static tests might dictate their choice.

Les organismes réglementaires, ou les fabriques qui voudraient utiliser les essais sur la toxicité au sein de leur programme d'autosurveillance, pourraient se faciliter la tâche en ayant recours à des essais statiques à concentration unique d'une durée de 96 heures à une concentration d'effluent de 65 pour cent. Lorsque les essais statiques sont utilisés, on recommande de changer la solution tous les jours. La quantité d'effluent nécessaire aux essais statiques qui requièrent une solution nouvelle chaque jour, ainsi que l'indiquent les calculs de l'appendice II, est d'une fois et demie la quantité requise au cours des essais à débit continu, de sorte que l'organisme réglementaire n'a aucun avantage à retirer de l'utilisation d'essais statiques lorsqu'il s'agit de tenir compte du problème causé par l'expédition des échantillons à un laboratoire central. Toutefois, dans le cas de fabriques qui disposent d'une quantité illimitée d'effluent, le choix de la méthode à utiliser se ferait en fonction de la simplicité des appareils exigés pour les essais statiques.

Essais statiques facultatifs pour surveillance courante.

Ratio of volume to weight of fish in static tests

If static tests are conducted, the ratio of volume of liquid to weight of fish should be 2 litres per gram of fish per day.

Lorsque l'on fait des essais statiques, la proportion du volume du liquide par rapport au poids du poisson devrait être de 2 litres par gramme de poisson par jour.

Proportion entre le volume d'eau et le poids du poisson dans les essais statiques

In continuous flow tests a 90 percent molecular exchange of liquid in 10 hours is required in tanks holding controls and fish exposed to

Les essais à débit continu exigent que 90 pour cent des molécules du liquide soient remplacées dans les réservoirs qui contiennent les poissons

effluent. (To determine the required rate of flow, see the reference to Sprague (1969) in Appendix II). A ratio of 1 to 2 litres per gram of fish per day should be adhered to.

témoins et dans ceux qui contiennent les poissons exposés à l'effluent, (pour établir le taux d'écoulement, voir le renvoi à Sprague (1969) à l'appendice II). Un rapport de 1 à 2 litres par gramme de poisson doit être utilisé.

Tank depth

The minimum depth of liquid in any tank shall be 15 cms.

La profondeur de liquide dans chaque réservoir ne devra pas être inférieure à 15 cm.

Quantité de liquide dans les réservoirs.

Dilution water

Water used for diluting effluent should be the water used for holding the stocks of fish used for testing purposes.

L'eau qui sert à diluer l'effluent doit être l'eau dans laquelle sont gardés les poissons destinés aux essais.

Eau de dilution

Species and size of fish for legal purposes

For legal purposes the test fish should always be rainbow trout, **Salmo gairdneri** Richardson, with an individual weight not exceeding 10 grams and the weight of the largest fish used in any series of concentrations tested should not be more than 1.5 times the weight of the smallest.

Le poisson d'essai utilisé à des fins officielles devrait toujours être la truite arc-en-ciel **(Salmo gairdneri Richardson)**, chaque poisson ne devant pas excéder les 10 grammes et le plus gros des poissons utilisés dans n'importe quelle série de concentrations soumise à l'essai ne doit pas dépasser plus d'une fois et demie le poids du plus petit.

Espèce et taille des poissons utilisés à des fins officielles.

Starve fish prior to and during tests

Test fish should not be fed for two days prior to their use, nor should they be fed during the tests.

Les poissons doivent être privés de nourriture pendant les deux jours qui précèdent l'essai, ni être nourris au cours des essais.

Priver les poissons de nourriture avant et au cours des essais.

No "hygienic" chemicals

Fish should not be treated with antibiotics or any other "hygienic" chemicals for two weeks prior to their being used in tests.

On ne doit pas administrer d'antibiotiques ou d'autres produits "hygiéniques" aux poissons dans les deux semaines qui précèdent les essais.

Pas de produits "hygiéniques".

No history of prior exposure

No test fish should have been previously exposed to pulp or paper mill effluent or to any other effluents.

Avant de servir aux essais, il ne faut pas que les poissons d'essai aient été exposés aux effluents des fabriques de pâtes et papiers ou à tout autre effluent.

Les poissons ne doivent pas avoir été exposés aux effluents.

Health of fish stocks

The daily percentage mortality of fish held as stock for the purpose of testing should not have exceeded one percent. Imported stocks of rainbow trout must have passed the disease control requirements of the Inspection Branch of the Fisheries Service of Environment Canada.

Le taux procentuel quotidien de mortalité chez les poissons gardés en réserve à l'intention des essais ne doit pas avoir dépassé 1 pour cent. Les truites arc-en-ciel importées doivent satisfaire aux exigences de la Direction de l'inspection du Service des pêches d'Environnement Canada, pour ce qui est du contrôle des maladies.

Santé des poissons.

Holding, acclimation and test temperatures

Fish stocks should be held at the ambient temperatures of their water supply, but test specimens should be acclimated to 15 ± 1°C over a period of two weeks prior to their being used in tests and the tests should be carried out at 15 ± 1°C.

Les réserves de poissons doivent être gardées à la température ambiante de leur source d'approvisionnement en eau, mais les poissons d'essai devraient être acclimatés à 15 ± 1°C. sur une période de deux semaines avant de subir les essais et ces derniers devraient être faits à 15 ± 1°C.

Acclimatation des poissons et températures d'essais

Dissolved oxygen requirements

If the effluent has been biologically treated or subjected to any other form of treatment which would have resulted in the stripping of volatiles, then dissolved oxygen levels should be maintained near saturation. If the effluent has not been biologically treated, the tests should be carried out at dissolved oxygen concentrations sufficient to meet the requirements of the test fish, and in the case of rainbow trout the recommended minimum level is 7 ppm. Dissolved oxygen should not exceed the saturation level.

Si l'effluent a fait l'objet d'un traitement biologique ou s'il a subi toute autre sorte de traitement qui aurait provoqué la perte des corps volatils, il faut alors garder l'oxygène dissout presque au point de saturation. Là où l'effluent n'a pas subi de traitement biologique, les essais doivent être menés à des concentrations d'oxygène dissout qui permettent de satisfaire aux besoins des poissons d'essai, soit un niveau minimal recommandé de 7 ppm dans le cas de la truite arc-en-ciel. L'oxygène dissout ne doit pas excéder le niveau de saturation.

Exigences relatives à l'oxygène dissout

Discretionary use of other species than rainbow trout

For non-legal routine monitoring purposes it may often be convenient to use indigenous species of fish other than rainbow trout. There is no objection to this practice, although it is obvious that the requirements of the species chosen with respect to temperature, dissolved oxygen, etc. will differ from those recommended earlier in these Guidelines for rainbow trout.[1] Therefore, the requirements should be adjusted according to the species used. If an indigenous species is used it is recommended that it should be one of the more sensitive species inhabiting the waters to which the effluent being tested is being discharged.

Liberté de choisir d'autres espèces que la truite arc-en-ciel

Dans le cas de surveillance courante à des fins non officielles, il se peut qu'il soit souvent plus simple d'utiliser d'autres espèces indigènes que la truite arc-en-ciel.[1] Rien ne s'oppose à cette pratique, bien qu'il soit évident que les besoins de l'espèce choisie ne seront pas les mêmes que ceux de la truite arc-en-ciel pour ce qui est de la température, de l'oxygène dissout, etc. suivant les recommandations précitées. Il faudra donc modifier les exigences en raison de l'espèce utilisée. Lorsque l'on a recours à une espèce indigène, on devrait utiliser une espèce sensible qui fréquente les eaux dans lesquelles l'effluent qui fait l'objet de l'essai se déverse.

Sample Collection

If the wastewaters from a mill have not been biologically treated, the method of sample collection should be the same as that employed for obtaining samples for BOD_5 and Total Suspended Solids determinations described later in these Guidelines. If the wastewaters have been biologically treated, having in mind that current systems are well mixed and have long detention times, it will suffice to take a single grab sample of a size required for the test at the outfall of the treatment system. Composite samples may be required by the regulatory agency where deemed appropriate.

Prélèvement des échantillons

Si les eaux résiduaires d'une fabrique n'ont pas subi de traitement biologique, on devrait prélever les échantillons en employant la méthode de prélèvement utilisée en vue de mesurer la DBO_5 et les solides en suspension de toute nature, méthode décrite plus loin. Dans le cas contraire, il suffira de prélever un seul échantillon instantané, en assez grande quantité, au point de déversement du dispositif de traitement, sans oublier que les dispositifs actuels sont très bien mélangés et exigent de longues durées de séjour. Il se peut que l'organisme réglementaire juge à propos d'exiger des échantillons composites.

Frequency of tests

It is recommended that during startup, and at mills having treatment problems, that single concentration tests at 65 percent should be conducted at least every two weeks. At mills having no treatment problems monthly tests should suffice.

Fréquence des essais

Il est recommandé que des essais à concentration unique à 65 pour cent soient faits au moins toutes les deux semaines au cours de périodes de mise en marche d'une fabrique et dans le cas de fabriques qui éprouvent des difficultés relatives au traitement. Pour ce qui est des fabriques qui n'ont pas de difficultés de traitement, des essais mensuels devraient suffire.

Schedule D calls for effluent samples to be maintained (shipped and stored) at 8°C. If convenient, the samples may be frozen solid immediately after being taken and shipped in that state to the regulatory agency.

L'annexe D exige que la température des échantillons d'effluents soit maintenue à 8°C au cours de l'expédition et de l'entreposage. Pour des raisons de commodité, les échantillons peuvent être congelés tout de suite après le prélèvement pour être expédiés dans cet état à l'organisme réglementaire.

SECTION 4.

ARTICLE 4

Method of calculating overall daily permitted deposits given in Appendix I

Subsections 4(1)(a) and 4(1)(c) of the Regulations indicate that the overall daily permitted deposits of Total Suspended Solids and BOD_5 from most mills may be calculated by "summing" the deposits permitted for the Component Process Categories of Schedule A and the Type

Méthode de calcul des dépôts globaux permis en un jour, (appendice I)

Les alinéas 4(1)a) et 4(1)c) du règlement indiquent que la quantité totale des dépôts de solides en suspension de toute nature et de DBO_5 permis en un jour pour la plupart des fabriques peut se calculer en faisant la somme des dépôts permis pour les éléments de transformation de

1. In order to obtain stocks of fish for testing purposes, mill managements may ask for them to be supplied by the regulatory agency or capture them locally if that is not convenient. Permission to capture fish locally will be required from the Fisheries Service of Environment Canada or the provincial fish and game authority.

1. Afin d'obtenir des réserves de poissons pour servir aux fins de l'analyse, la direction des fabriques peut demander aux organismes réglementaires de lui en fournir ou elle peut les faire capturer dans la région si elle juge la chose plus commode. Elle devra demander la permission de capturer du poisson dans la région au Service des pêches d'Environnement Canada ou aux autorités provinciales de la chasse et de la pêche.

of Processes of Schedule B which are taking place in the mill. **To arrive at the correct overall daily permitted deposits for any mill not identified in Subsections 4(1)(b) and 4(1)(d), it is recommended that the example shown in Appendix I of these Guidelines be followed very closely.**

l'annexe A et pour les genres de procédés de l'annexe B qu'emploie la fabrique. **Pour en arriver avec précision à la quantité totale des dépôts permis en un jour pour toute fabrique non désignée aux alinéas 4(1)b) et 4(1)d), il est recommandé de suivre très étroitement l'exemple donné à l'appendice I des présentes lignes directrices.**

Permitted deposits of Total Suspended Solids from hardboard insulating and building board mills given as single values

It will be noted that it is not necessary to calculate the overall daily permitted deposits of Total Suspended Solids for the hardboard, insulating and building board mills and dissolving grade sulfite mills referred to in Subsection 4(1)(b) by the summative procedure described in Appendix I. For these types of mills, the Total Suspended Solids deposit per ton of product includes all mill operations and should be multiplied by the tons of product as produced daily to arrive at the overall daily permitted deposit for the mill. The latter does not include the daily permitted deposit from wood preparation which should be added and calculated by the method of Appendix I.

Il est à noter qu'il n'est pas nécessaire de calculer par la méthode décrite à l'appendice I la quantité totale de dépôts permis de solides en suspension de toute nature en un jour pour les fabriques de panneaux durs, de panneaux isolants et de panneaux de construction et pour les fabriques de pâte au bisulfite à dissoudre énumérées à l'alinéa 4(1)b). Pour les fabriques de ce genre le dépôt de solides en suspension de toute nature par tonne de produit comprend toutes les opérations de la fabrique et doit être mutiliplié par le nombre de tonnes de produit fabriqué par jour pour obtenir la quantité totale de dépôt permis en un jour pour la fabrique. La quantité ainsi obtenue ne comprend pas le dépôt permis en un jour pour la préparation du bois, qui doit être ajouté et calculé selon la méthode décrite à l'appendice I.

Les dépôts permis de solides en suspension de toute nature pour les fabriques de panneaux durs, de panneaux isolants et de panneaux de construction ont des valeurs uniques

Permitted deposit of BOD_5 from dissolving grade sulfite mills

It will be noted that Subsection 4(1)(d) sets forth the deposit of BOD_5 per ton of air-dry product which is permitted for all operations taking place in a dissolving grade sulfite mill. To arrive at the overall daily permitted deposit BOD_5 for such mills, multiply the number of air-dry tons of pulp produced per day by 580.

L'alinéa 4(1)d) indique la quantité de dépôt de DBO_5 par tonne de produit (sec à l'air) permise pour toutes les opérations d'une fabrique de pâte au bisulfite à dissoudre. Pour obtenir le dépôt total de DBO_5 permis en un jour pour ce type de fabrique, on doit multiplier par 580 le nombre de tonnes de pâte (sèche à l'air) produite par jour.

Dépôt de de DBO_5 permis pour les fabriques de pâte au bisulfite à dissoudre.

Permitted deposits of BOD_5 from groundwood and paper making operations could not be derived

Deposits of BOD_5 not covered by Schedule B to be determined at each mill and included in overall permitted deposit.

As indicated in the calculations and footnotes of Appendix I, it is necessary to take into account the BOD_5 generated by groundwood and paper making operations because no permitted deposits are shown for them in Schedule B. The reason for their exclusion from the schedule was that no representative values could be found. For example, it was found that the BOD_5 generated by groundwood operations varies from 20 to 60 pounds per air-dry ton of product. Therefore, as indicated in the Appendix, programs of sampling to derive appropriate permitted deposits of BOD_5 will be required for processes which are not shown in Schedule B but are included in the operation of some mills.

Comme l'indiquent les calculs et les notes de bas de page de l'appendice I, il faut tenir compte de la DBO_5 produite par la fabrication de pâte mécanique et de papier même si l'annexe B ne fait état d'aucun dépôt permis en ce qui a trait à ces opérations. La raison de cette omission est qu'on n'a pas pu trouver de valeurs représentatives dans ces cas. Par exemple, on a trouvé que la DBO_5 contenue dans l'effluent produit par la fabrication de pâte mécanique varie de 20 à 60 livres par tonne de produit (sec à l'air). Ainsi, comme le souligne l'appendice, il faudra instituer des programmes d'échantillonnage pour déterminer la quantité permise de dépôts de DBO_5 pour les procédés qui ne sont pas mentionnés à l'annexe B, mais qu'emploient certaines fabriques.

Les dépôts de DBO_5 permis pour la fabrication de pâte mécanique et de papier n'ont pas pu être trouvés

Les dépôts de DBO_5 permis dont l'annexe B ne fait aucun état doivent être déterminés à chaque fabrique et inclus dans le dépôt global.

In cases where an overall deposit has been calculated by the method shown in Appendix I, the deposit from the mill as a whole must not exceed the overall daily permitted deposit, although permitted deposits from the individual

Dans les cas où il aura fallu calculer un dépôt global selon la méthode démontrée à l'appendice I, le dépôt de l'ensemble de la fabrique ne devra pas dépasser le dépôt global permis pour un jour, bien que les quantités permises pour chaque

Component Process Categories or Type Processes being employed in the mill may be exceeded individually.

élément de transformation ou chaque genre de procédé utilisé par la fabrique puissent être dépassés individuellement.

SECTION 5

ARTICLE 5

Records of Total Suspended Solids, BOD_5, flow, production, yield required on a regular basis.

For the purpose of determining whether mills are complying with overall daily permitted deposits, companies will be required, on a regular basis, to submit records of discharges of Total Suspended Solids, BOD_5, effluent flow and daily production to the Department or designated regulatory agency, or both, at intervals specified by the regulatory agency. Companies will also be required to submit information to show the pulp yield of their mills, but unlike other parameters related to effluent quality, this information will not be required on a regular basis.

Dans le but de déterminer si les fabriques respectent la norme fixant la quantité totale de dépôts permis par jour, les entreprises devront régulièrement soumettre des registres faisant état des rejets de solides en suspension de toute nature et de DBO_5, du débit d'effluent et de la production journalière à l'intention du Ministère ou de l'organisme réglementaire, ou les deux, à des intervalles spécifiés par ce dernier. Les entreprises devront aussi donner des renseignements sur le rendement en pâte de leur fabrique, mais, contrairement aux autres mesures relatives à la qualité de l'effluent, cette information ne sera pas exigée régulièrement.

Obligation de tenir régulièrement des registres faisant état des solides en suspension de toute nature de la DBO_5, du débit, de la production et du rendement

The authority to require information from companies stems from Subsection 33A(3) of the Act which states that any person who operates any undertaking, shall at the request of the Minister, provide him with information relating to the operation of the undertaking.

L'autorisation de demander des renseignements aux entreprises est stipulée au paragraphe 33A(3) de la Loi selon lequel, lorsque le Ministre le demande, tout exploitant d'entreprise doit lui fournir les renseignements relatifs à l'exploitation de l'entreprise.

Information relating to treatment performance may be required

Chiefly for the purpose of assessing treatment performance, companies may be required, on a regular or on an irregular basis, to furnish a regulatory agency with information other than that needed to ascertain whether their mills are in compliance with the Regulations. For example, companies operating primary treatment systems will be asked to determine Total Suspended Solids on the influent to the systems as well as the effluent from them on a regular basis at intervals agreed upon between themselves and the regulatory agencies in order to determine the removal efficiencies of the systems. From a narrow standpoint, it is important for both a company and the regulatory agency to know the efficiency of removal of Total Suspended Solids at a mill.[1]

Surtout en vue de l'évaluation du rendement des systèmes de traitement, les entreprises peuvent être obligées d'une façon régulière ou non, de fournir à l'organisme réglementaire d'autres renseignements que ceux qui établissent si leurs fabriques observent le règlement. Par exemple, les fabriques munies de systèmes de traitement primaire pourront être priées de déterminer la quantité de solides en suspension de toute nature de l'effluent à son entrée dans les systèmes ainsi qu'à sa sortie; cette détermination, qui devra se faire régulièrement et à des intervalles déterminés entre elles et les organismes réglementaires, a pour but de déterminer l'efficacité des systèmes. D'un point de vue particulier, il est aussi important pour l'entreprise que pour l'organisme réglementaire de connaître l'efficacité d'élimination des solides en suspension de toute nature des systèmes de la fabrique.[1]

Les renseignements nécessaires à l'évaluation des systèmes de traitement peuvent être exigés

The previously mentioned sampling program for groundwood BOD_5 is an example of information which would be requested on an irregular basis, and another example would be a request

Le programme d'échantillonnage de la DBO_5 produite par la fabrication de la pâte mécanique, programme dont il a déjà été question, est un exemple de renseignements qu'on pourrait

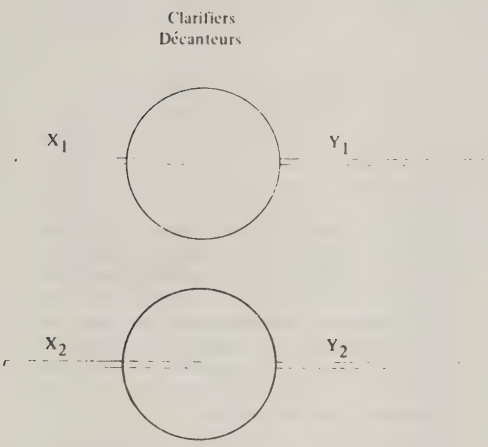
1. From a broader standpoint, the classification and analysis of such data from a large number of Canadian mills is exceedingly important because it will provide the basis for more accurate determination of permitted deposits in the future than is possible at present.

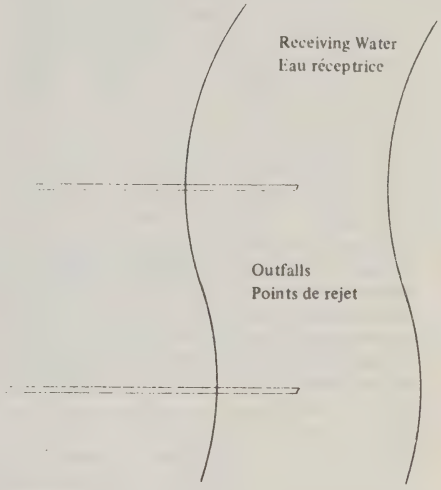
1. D'un point de vue général, la classification et l'analyse des données extraites des renseignements fournis par de nombreuses fabriques au Canada seront extrêmement importantes parce qu'elles permettront de déterminer avec davantage de précision les quantités de dépôts autorisées.

for a survey of Total Suspended Solids discharges from point sources in a mill for "trouble-shooting" purposes.

While Schedule E is fairly easy to understand, its intent can be more readily appreciated by referring to the following diagrams:

Case 1: **A mill having one or more outfalls not connected with a biological treatment system.**





Requirement: Daily flows are to be measured at Y_1 and Y_2. Daily composite samples are to be obtained at Y_1 and Y_2, and BOD_5 and Total Suspended Solids are to be measured daily either individually on aliquots from Y_1 and Y_2 or on an aliquot of a "composite-composite" formed by combining portions taken from Y_1 and Y_2 in proportion to the daily flows measured at those points. These measurements, (with BOD_5 and Total Suspended Solids expressed in pounds per day) and including total daily effluent flow and total daily tonnage of product are to be submitted to the regulatory agency at a frequency requested by the regulatory agency.

Composite sampling devices should be installed at points X_1 and X_2 and operated on an irregular basis in order to determine differences in Total Suspended Solids between Y_1 and X_1 and Y_2 and X_2 and hence the efficiencies of removal.

demander de façon irrégulière; un autre exemple serait l'exécution d'un programme de prélèvement des déversements de solides en suspension de toute nature des points de rejet de la fabrique afin de localiser les pannes et d'y remédier.

Bien que l'annexe E soit assez compréhensible, il sera plus facile d'en saisir le but si l'on étudie le diagramme suivant:

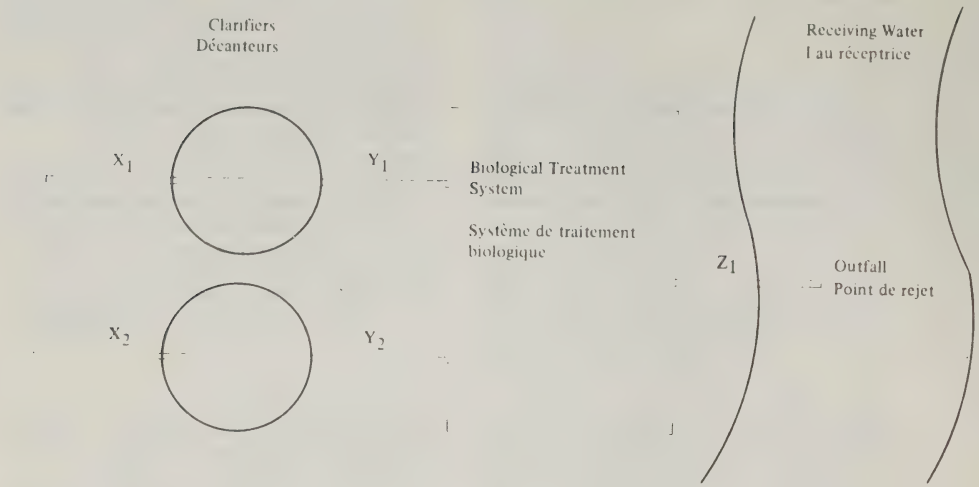
Premier cas: **Fabrique qui a un ou plusieurs points de rejet non raccordés à un système de traitement biologique.**

Exigences: Les débits journaliers doivent être mesurés aux points Y_1 et Y_2. On doit aussi se procurer aux points Y_1 et Y_2 des échantillons composites journaliers et mesurer les quantités quotidiennes de DBO_5 et de solides en suspension de toute nature, soit en prenant chaque jour des quantités aliquotes de Y_1 et de Y_2 ou en prélevant une quantité aliquote d'un mélange d'échantillons composites formé par la combinaison de parties de Y_1 et de Y_2 en proportion avec les débits journaliers mesurés en ces points. Ces mesures (les quantités de DBO_5 et de solides en suspension de toute nature exprimées en livres en un jour), le débit d'effluent journalier et la production quotidienne doivent être soumis à l'organisme réglementaire aussi souvent que ce dernier le réclame.

Il faut installer des dispositifs d'échantillonnage composite aux points X_1 et X_2 et les faire fonctionner de façon irrégulière afin de déterminer les différences dans les quantités de solides en suspension de toute nature entre Y_1 et X_1 et entre Y_2 et X_2 et de connaître ainsi l'efficacité d'élimination.

Case 2: **A mill with a biological treatment system**

Second cas: **Fabrique munie d'un système de traitement biologique.**



Requirement: Daily flows are to be measured at Y_1 and Y_2. Daily composite samples will be obtained at Y_1 and Y_2 and Total Suspended Solids will be determined daily, either on aliquots taken from Y_1 and Y_2 or on an aliquot of a "composite-composite" formed by combining portions taken from Y_1 and Y_2 in proportion to the daily flows measured at those points. The results, expressed as pounds of Total Suspended Solids per day, will be reported on a regular basis at a frequency requested by the regulatory agency.

A grab sample will be taken daily at point Z_1, filtered to remove biological solids, and the BOD_5 will be determined. The results will be reported as pounds per day. These data, together with daily measurements of effluent discharge and tonnage of product produced daily will be reported on a regular basis at a frequency requested by the regulatory agency.

For the purpose of checking the efficiency of primary treatment, Total Suspended Solids will be determined on aliquots of composite samples of effluent taken at points X_1 and X_2. It is not intended that these determinations should be made daily, but they should be made at regular intervals and the results should be reported in pounds per day at a frequency requested by the regulatory agency.

Exigences: Les débits journaliers doivent être mesurés aux points Y_1 et Y_2. Il faut se procurer aux points Y_1 et Y_2 des échantillons composites journaliers et déterminer les quantités quotidiennes de solides en suspension de toute nature, soit en prenant des quantités aliquotes de Y_1 et Y_2 ou en prélevant une quantité aliquote d'un mélange d'échantillons composites formé par la combinaison de parties de Y_1 et de Y_2 en proportion avec les débits journaliers mesurés en ces points. Les résultats, exprimés en livres de solides en suspension de toute nature en un jour, seront transmis d'une façon régulière et aussi souvent que le demandera l'organisme réglementaire.

On devra prendre tous les jours un échantillon instantané au point Z_1, le filtrer pour en éliminer les substances biologiques solides et déterminer la DBO_5. Les résultats seront exprimés en livres par jour. Les données ainsi recueillies, de même que les mesures journalières des rejets d'effluent et la production quotidienne feront l'objet de rapports réguliers aussi souvent que le demandera l'organisme réglementaire.

Pour vérifier l'efficacité du traitement primaire, on déterminera les solides en suspension de toute nature selon des quantités aliquotes d'échantillons composites d'effluent prélevées aux points X_1 et X_2. Ces analyses ne sont pas censées se faire tous les jours, mais à des intervalles réguliers et les résultats devraient être exprimés en livres par jour et soumis aussi souvent que le demande l'organisme réglementaire.

Similarly, for the purpose of determining efficiency of secondary treatment, the BOD_5 will be determined on aliquots of composite samples taken at points Y_1 and Y_2. These determinations need not be made daily, so long as they are made on a regular basis and reported in pounds per day at a frequency requested by the regulatory agency.

For general information purposes, BOD_5 determinations should be made on unfiltered aliquots of grab samples taken at point Z_1. The time intervals between determinations may be quite broad. The results should of course be reported to the regulatory agency at such a frequency as it may request.

As a suggestion to the regulatory agencies administering the Regulations, it would be desirable to require that the "extra" determinations needed for the purpose of assessing efficiency of removal of Total Suspended Solids should be made at weekly intervals, and that the "extra" BOD_5 determinations needed to assess secondary treatment efficiency should be made at bi-weekly intervals. If difficulties with treatment are being experienced and it is considered necessary by the regulatory agency to require more frequent sampling, the agency may require more frequent sampling until the difficulties are overcome.

De même, pour vérifier l'efficacité du traitement secondaire, on déterminera la DBO_5 de quantités aliquotes d'échantillons composites pris aux points Y_1 et Y_2. Il n'est pas nécessaire de faire ces analyses tous les jours à condition qu'on les fasse d'une façon régulière et qu'on transmette les résultats, exprimés en livres par jour, aussi souvent que le réclame l'organisme réglementaire.

A des fins d'information générale, les analyses de DBO_5 doivent se faire en utilisant des quantités aliquotes d'échantillons instantanés, non filtrés, prélevés au point Z_1. Les intervalles entre chaque analyse peuvent être assez longs. Les résultats doivent, bien sûr, faire l'objet d'un rapport à l'intention de l'organisme réglementaire aussi souvent que ce dernier le demande.

Il serait souhaitable que les organismes chargés de l'exécution du règlement demande de faire toutes les semaines les analyses supplémentaires nécessaires à l'évaluation de l'efficacité des systèmes d'élimination des solides en suspension de toute nature et tous les quinze jours les déterminations supplémentaires de DBO_5 nécessaires pour évaluer l'efficacité du traitement secondaire. Si le traitement présente quelque difficulté et que l'organisme réglementaire juge à propos d'augmenter la fréquence de l'échantillonnage, il peut le faire jusqu'à ce que les difficultés soient résolues.

SECTION 6

Permitted deposits more stringent for new than old mills

As a matter of policy, all new mills will be expected from the period of startup to comply with the more stringent permitted deposits of Total Suspended Solids and BOD_5 shown in Columns III and V of Schedule A and Column III of Schedule B. New mills will also be expected to meet the requirements of Schedule D from the period of startup.

The daily permitted deposits allowed from operations which have been changed within altered mills will be the same as those for new mills, but the daily permitted deposits allowed from operations which have not been changed will remain the same as those from existing mills. In the case of an expanded mill, the daily permitted deposits of BOD_5 and Total Suspended Solids will be increased. The increase will be calculated by adding to the overall daily permitted deposits amounts derived by multiplying the increased daily tonnage of product by the appropriate amounts shown for new, expanded

ARTICLE 6

Les dépôts permis sont moins élevés pour les nouvelles fabriques que pour les anciennes.

On s'attend que toutes les nouvelles fabriques se conforment, dès la mise en marche de l'entreprise, aux normes les plus strictes relatives aux dépôts de solides en suspension de toute nature et de DBO_5 énumérés aux colonnes III et V de l'annexe A et à la colonne III de l'annexe B. Les nouvelles fabriques devront aussi répondre dès le début aux exigences stipulées à l'annexe D.

Pour des opérations qui ont fait l'objet d'un changement dans le cas des fabriques modifiées, la quantité de dépôts permis en un jour sera la même que pour les nouvelles fabriques, mais, en ce qui a trait aux opérations restées inchangées, la quantité de dépôts permis en un jour demeurera celle des fabriques existantes. Les dépôts de DBO_5 et de solides en suspension de toute nature permis en un jour pour les fabriques à capacité accrue augmenteront. Les hausses seront déterminées par l'addition à la quantité globale de dépôts permis en un jour les quantités journalières résultant de la multiplication de l'augmentation de la production exprimée en tonnes par les chiffres appropriés établis aux annexes A et B pour les fabriques nouvelles, à

or altered mills in Schedules A and B. The increases in permitted deposits will become applicable from the period of startup.

Altered and expanded mills will be expected to meet the requirements of Schedule D from the period of startup.

Dates for compliance to be negotiated with each existing mill and entered in Schedule F.

It will be noted in Schedule F, that mills answering the definition of new, expanded or altered after the date of promulgation will be expected to meet the requirements of Schedules A, B, and D, after "that date". Existing mills will not be expected to meet the requirements of the Regulations immediately after the date of promulgation, which explains why no dates are specified for existing mills in Column II of Schedule F. It is intended that individual dates for compliance with the Regulations will be developed with every existing mill in Canada. Environment Canada and regulatory agencies to which the administration of the Fisheries Act and Regulations have been delegated will conduct negotiations for pollution abatement programs with all pulp and paper companies and arrive at dates of compliance for each mill, which together with the name of the mill will be entered into Schedule F.

General Comments

In cases where provincial pollution control requirements differ from the requirements of these Regulations, the more stringent requirements shall apply.

Local situation may require more stringent control than required by the Regulations

It is recognized that there may be situations at some mill locations where the requirements of these Regulations will not furnish sufficient protection for the aquatic environment, and where the requirements of the regulations of the provincial pollution control agency may also be insufficient. In such cases, attempts will be made by Environment Canada or the designated provincial regulatory agency to negotiate an appropriate pollution abatement program. If these attempts fail to elicit agreement from the company, there is the authority under the Fisheries Act to seek an Order in Council which will require the company to comply with the requirements. Orders in Council will not be sought without the full knowledge, or without consideration of any reasonable objections from any provincial agency. Indeed this mechanism should not often be required, but will be used if necessary.

capacité accrue et modifiées. Les augmentations de dépôts permis entreront en vigueur dès la mise en opération.

Les fabriques modifiées et à capacité accrue devront aussi satisfaire aux conditions de l'annexe D dès leur mise en marche.

Les dates auxquelles chaque fabrique existante devra se soumettre au règlement doivent être négociées et inscrites à l'annexe F.

Dans l'annexe F, il faut noter que les fabriques répondant aux définitions de fabriques nouvelles, à capacité accrue ou modifiées après la date de promulgation devront satisfaire aux conditions stipulées aux annexes A, B et D à compter de cette date. Les fabriques existantes ne seront pas tenues de répondre aux exigences du règlement immédiatement après la promulgation, ce qui explique l'absence de date concernant ce genre de fabriques à la colonne II de l'annexe F. On projette d'établir les dates particulières auxquelles chaque fabrique existante devra se soumettre au règlement. Environnement Canada et les organismes chargés de l'exécution de la Loi sur les pêcheries et du règlement mèneront des négociations au sujet de programmes de réduction de la pollution avec chaque fabrique de pâtes et papiers pour déterminer la date d'application du règlement relative pour chacune, et cette date sera inscrite à l'annexe F ainsi que le nom de la fabrique.

Remarques générales

Dans les cas où les exigences provinciales de lutte contre la pollution diffèrent de celles qui sont énoncées dans le présent règlement, ce sont les normes les plus rigoureuses qui s'appliquent.

Des situations locales peuvent nécessiter un contrôle plus rigoureux que le contrôle réglementaire.

Il y aura peut-être des situations où les exigences du présent règlement n'apporteront pas une protection suffisante à l'environnement aquatique et où les exigences du règlement énoncées par l'organisme provincial de lutte contre la pollution seront également insuffisantes. Dans de tels cas, Environnement Canada ou l'organisme réglementaire désigné de la province tentera de négocier un programme approprié de réduction de la pollution. Si l'entreprise refuse d'en venir à une entente, la Loi sur les pêcheries autorise à demander qu'un décret du conseil ordonne à l'entreprise de se soumettre aux exigences. Avant de chercher à obtenir l'adoption de tels décrets, l'autorité prendra connaissance et tiendra compte de toute objection raisonnable de la part de l'organisme provincial.

En fait, ces mesures ne devraient pas être très souvent nécessaires, mais elles seront employées si cela s'impose.

Early submission of plans of altered and expanded mills is mutually advantageous

Subsections 33A(1) and 33A(2) of the Fisheries Act empower the Minister to require any company planning to construct, alter or expand a mill to submit plans of the undertaking and the Minister is also authorized to require the modification of the plans or may prohibit the undertaking if such an undertaking would in his opinion constitute an offence under Subsection 33(5) of the Fisheries Act. As a general principle, it is suggested that it would be short-sighted for any company contemplating the construction, alteration or expansion of a mill to wait until the final engineering drawing had been prepared before ascertaining whether the plans of the new works, including treatment facilities, would be considered to be in compliance with the Fisheries Act. Instead, it would be to the company's advantage to notify the Department or designated regulatory agency well in advance. Particularly in the case of a new mill, the Department or designated regulatory agency should be notified at the time of commencement of feasibility studies so that studies of obviously undesirable sites could be avoided. Such early notification would benefit to the regulatory agency by giving it ample time conduct necessary baseline ecological studies.

The BOD_5 values shown in Columns II and III of Schedule B for kraft pulping and kraft belaching are intended to show the amounts of BOD_5 permitted to be discharged from a kraft mill **before** the effluent has passed through a secondary treatment system. It is highly unlikely that the effluent from any kraft mill will be able to meet the requirements for survival of fish set forth in Schedule D without the application of secondary treatment, which in terms of present-day technology means biological treatment. After the application of biological treatment to remove toxicity, the BOD_5 of the effluent from kraft mills will be considerably reduced; probably by a factor of 75 to 90 percent.

La soumission à l'avance des plans de fabriques "nouvelles", "modifiées", et à "capacité accrue" est mutuellement avantageuse.

Les paragraphes 33A(1) et 33A(2) de la Loi sur les pêcheries autorisent le Ministre à exiger de tout exploitant qui projette de construire, de modifier ou d'agrandir une fabrique de lui fournir les plans de l'entreprise; le Ministre peut aussi exiger la modification de ces plans ou en interdire la réalisation s'il est d'avis que l'entreprise constitue une infraction en vertu du paragraphe 33(5) de la Loi sur les pêcheries. En général, ce serait faire preuve d'imprévoyance de la part d'une entreprise qui projette la construction, la modification ou l'agrandissement d'une fabrique d'attendre que le dernier dessin technique soit fait pour s'assurer si les plans des nouveaux travaux, y compris ceux des installations de traitement, satisfont aux exigences de la Loi sur les pêcheries. Au contraire, il serait à l'avantage de l'entreprise d'annoncer bien à l'avance ses intentions au Ministère ou à l'organisme réglementaire désigné. Surtout dans le cas d'une nouvelle fabrique, le Ministère ou l'organisme réglementaire devrait être averti dès le début des études de praticabilité, ainsi on évitera l'étude d'emplacements mal choisis. Un tel préavis donnerait à l'organisme réglementaire amplement le temps de mener les études écologiques de base qui s'imposent.

Les quantités de DBO_5 citées aux colonnes II et III de l'annexe B et destinées aux procédés de cuisson et de blanchiment de la pâte kraft désignent les quantités de DBO_5 qu'une fabrique de pâte kraft peut déverser **avant** que l'effluent ne soit passé à travers un système de traitement secondaire. Il est très peu probable que l'effluent de toute fabrique de pâte kraft puisse répondre aux conditions de survie des poissons établies à l'annexe D sans l'emploi d'un système de traitement secondaire qui équivaut dans le monde de la technique moderne à un traitement bilogique. L'utilisation d'un traitement biologique pour éliminer la toxicité réduira de beaucoup la DBO_5 de l'effluent des fabriques de pâte kraft; peut-être de 75 à 90 pour cent.

APPENDIX 1

SAMPLE CALCULATIONS FOR TOTAL SUSPENDED SOLIDS AND BOD_5

Hypothetical mill marketing the following products:

a) Bleached market sulphite pulp 200 tpd

b) Newsprint 500 tpd

c) Coated, fine & specialty papers 98tpd

The newsprint production comprises 125 tpd unbleached sulphite furnish and 375 tpd brightened groundwood furnish.

The coated, fine & specialty papers (98 tpd[1]) are manufactured from

45 tpd (air-dry) bleached sulphite
25 tpd (air-dry) brightened groundwood
30 tpd (air-dry) purchased bleached kraft[2]

The total bleached sulphite production of this mill is

245 tpd (200 tpd (market) + 45 tpd (paper))

The total unbleached sulphite production of this mill is 125 tpd (to news)

The total brightened groundwood production of this mill is 400 tpd (375 tpd (to news) + 25 tpd (to paper)).

A. Calculation of Overall Permitted Deposit of Total Suspended Solids (Schedule A)

Assume that logs are not washed after debarking
Assume an unbleached sulphite yield of 54%
Assume a bleached sulphite yield of 49%
Assume a groundwood yield of 96%
Assume a moisture content of 10% (where product is sold as air-dry tons)

1. Assuming that the final product as produced contained only 8 percent moisture, while 100 air-dry tons of furnish had been used, the record of papers sold would show as 98 tons i.e. $100 \times \frac{90}{92}$ tons

2. Kraft is purchased, thus no allowances are made for kraft pulp manufacturing, but 30 tpd of kraft are included in the allowance for paper making.

APPENDICE I

EXEMPLE TYPE POUR LE CALCUL DES SOLIDES EN SUSPENSION DE TOUTE NATURE ET DE LA DBO_5

Une fabrique hypothétique qui met en marché les produits suivants:

a) pâte marchande blanchie au bisulfite 200 t/j
b) papier-journal 500 t/j
c) papiers couchés, fins et à usages spéciaux 98 t/j

La production du papier-journal demande 125 t/j de pâte non blanchie au bisulfite et 375 t/j de pâte mécanique blanchie.

Pour fabriquer les papiers couchés, fins et à usages spéciaux (98 t/j)[1] il faut:

45 t/j (sec à l'air) de pâte blanchie au bisulfite
25 t/j (sec à l'air) de pâte mécanique blanchie
30 t/j (sec à l'air) de pâte kraft blanchie achetée[2]

La production totale de pâte blanchie au bisulfite de la présente fabrique est de

245 t/j (200 t/j (pâte marchande) + 45 t/j (papier))

La production totale de pâte non blanchie au bisulfite de la fabrique est de 125 t/j (pour le papier-journal). La production totale de pâte mécanique blanchie de la fabrique est de 400 t/j (375 t/j (pour le papier-journal) + 25 t/j (pour le papier)).

A. Calcul du dépôt global permis de solides en suspension de toute nature. (Annexe A)

Conditions:
– Les billes ne doivent pas être lavées après l'écorçage
– Le rendement en pâte au bisulfite non blanchie doit être de 54%
– Le rendement en pâte au bisulfite blanchie doit être de 49%
– Le rendement en pâte mécanique doit être de 96%
– La teneur en humidité doit être de 10% (quand le produit est vendu à la tonne, sec à l'air).

1. A supposer que le produit final contient seulement 8 pour cent d'humidité quand on utilise une composition de 100 tonnes (sec à l'air), le registre ferait état de 98 tonnes de papier vendu, c'est-à-dire $100 \times \frac{90}{92}$ tonnes.

2. La pâte kraft est achetée; il n'y a donc pas de dépôt permis pour sa fabrication, mais les 30 tonnes de pâte sont incluses dans la quantité de dépôts autorisée pour la fabrication du papier.

1. **From debarking (wet drum process)**

Air-dry tons unbleached sulphite manufactured = 125

Oven-dry tons unbleached sulphite manufactured $0.9 \times 125 = 113$

Oven-dry tons of wood required $\frac{113 \times 100}{54} = 209$

TOTAL SUSPENDED SOLIDS PERMITTED $209 \times 10 = 2090$ lbs/day

Air-dry tons bleached sulphite manufactured = 245

Oven-dry tons bleached sulphite manufactured $0.9 \times 245 = 221$

Oven-dry tons of wood required $\frac{221 \times 100}{49} = 451$

TOTAL SUSPENDED SOLIDS PERMITTED $451 \times 10 = 4510$ lbs/day

Air-dry tons groundwood manufactured = 400

Oven-dry tons groundwood manufactured $0.9 \times 400 = 360$

Oven-dry tons of wood required $\frac{360 \times 100}{96} = 375$

TOTAL SUSPENDED SOLIDS PERMITTED $375 \times 10 = 3750$ lbs/day

2. **From bleached market sulphite manufacturing**

Market sulphite – pulping $\frac{200 \times 54 \times 7}{49} = 1543$ lbs/day

1. **Provenant de l'écorcage au tambour (procédé humide)**

Tonnes de pâte non blanchie au bisulfite (sec à l'air) = 125

Tonnes de pâte non blanchie au bisulfite (sec absolu) $0.9 \times 125 = 113$

Tonnes de bois nécessaires (sec absolu) $\frac{113 \times 100}{54} = 209$

DÉPÔTS PERMIS DE SOLIDES EN SUSPENSION DE TOUTE NATURE $209 \times 10 = 2090$ lb/j

Tonnes de pâte blanchie au bisulfite (sec à l'air) = 245

Tonnes de pâte blanchie au bisulfite (sec absolu) $0.9 \times 245 = 221$

Tonnes de bois nécessaires (sec absolu) $\frac{221 \times 100}{49} = 451$

DÉPÔTS PERMIS DE SOLIDES EN SUSPENSION DE TOUTE NATURE $451 \times 10 = 4510$ lb/j

Tonnes de pâte mécanique (sec à l'air) = 400

Tonnes de pâte mécanique (sec absolu) $0.9 \times 400 = 360$

Tonnes de bois nécessaires (sec absolu) $\frac{360 \times 100}{96} = 375$

DÉPÔTS PERMIS DE SOLIDES EN SUSPENSION DE TOUTE NATURE $375 \times 10 = 3750$ lb/j

2. **Provenant de la fabrication de pâte marchande blanchie au bisulfite**

Pâte marchande – cuisson $\frac{200 \times 54 \times 7}{49} = 1543$ lb/j

Market sulphite
– bleaching 200 x 6 = 1200 lbs/day

Market sulphite
– sheet
formation 200 x 2 = 400 lbs/day

3. From newsprint manufacturing

Unbleached sulphite furnish
– pulping 125 x 7 = 875 lbs/day

Groundwood furnish
– pulping 375 x 13 = 4875 lbs/day

Groundwood furnish
– brightening (bleaching) 375 x 2 = 750 lbs/day

Paper making (integrated single product paper making)
– sulphite 125 x 3 = 375 lbs/day
– groundwood 375 x 5 = 1875 lbs/day

4. From coated, fine & specialty papers

Bleached sulphite furnish
– pulping $\frac{45 \times 54 \times 7}{49}$ = 347 lbs/day

Bleached sulphite furnish
– bleaching 45 x 6 = 270 lbs/day

Groundwood furnish 25 x 13 = 325 lbs/day

Groundwood furnish
– brightening (bleaching) 25 x 2 = 50 lbs/day

Paper making (fine & specialty multi-product paper making)
– sulphite $\frac{45 \times 25 \times 98}{100}$ = 1102 lbs/day
– kraft $\frac{30 \times 25 \times 98}{100}$ = 735 lbs/day
– groundwood $\frac{25 \times 25 \times 98}{100}$ = 613 lbs/day

Pâte marchande
– blanchiment 200 x 6 = 1200 lb/j

Pâte marchande
– transformation en feuille 200 x 2 = 400 lb/j

3. Provenant de la fabrication du papier-journal

Fourniture de pâte non blanchie au bisulfite
– cuisson 125 x 7 = 875 lb/j

Fourniture de pâte mécanique
– réduction en pâte 375 x 13 = 4875 lb/j

Fourniture de pâte mécanique
– blanchiment 375 x 2 = 750 lb/j

Fabrication de papier (fabrication intégrée d'un seul produit de papier)
– au bisulfite 125 x 3 = 375 lb/j
– pâte mécanique 375 x 5 = 1875 lb/j

4. Provenant de la fabrication de papiers couchés, fins et à usages spéciaux

Fourniture de pâte blanchie au bisulfite
– cuisson $\frac{45 \times 54 \times 7}{49}$ = 347 lb/j

Fourniture de pâte au bisulfite
– blanchiment 45 x 6 = 270 lb/j

Fourniture de pâte mécanique 25 x 13 = 325 lb/j

Fourniture de pâte mécanique
– blanchiment 25 x 2 = 50 lb/j

Fabrication de papiers fins et à usages speciaux (fabrication de plusieurs produits de papier)
– au bisulfite $\frac{45 \times 25 \times 98}{100}$ = 1102 lb/j
– kraft $\frac{30 \times 25 \times 98}{100}$ = 735 lb/j
– pâte mécanique $\frac{25 \times 25 \times 98}{100}$ = 613 lb/j

OVERALL DAILY PERMITTED DEPOSIT OF TOTAL SUSPENDED SOLIDS = 25,685 lbs/day

B. Calculation of Overall Daily Permitted Deposit of BOD_5 (Schedule B)

Assume a BOD_5 allowance for (brightened) mechanical pulp of 30 lbs/ton[1] and
Assume a BOD_5 allowance for coated fine & specialty papers of 3 lbs/ton[1].

1. Unbleached sulphite
   – pulping 125 x 255 = 31,875 lbs/day
   Bleached sulphite
   – pulping $\frac{245 \times 54 \times 255}{49}$ = 68,850 lbs/day
   – bleaching 245 x 35 = 8,575 lbs/day
2. Groundwood operations
   400 x 30 = 12,000 lbs/day
3. Coated, fine & specialty paper making operations
   98 x 3 = 294 lbs/day

OVERALL DAILY PERMITTED DEPOSIT OF BOD_5 = 121,594 lbs/day

1. Schedule B does not include permitted deposits of BOD_5 for groundwood or paper making processes, because of variability of data. Thus, these are assumed values. Real values at each mill must be obtained by sampling.

DÉPÔTS TOTAUX PERMIS PAR JOUR DE SOLIDES EN SUSPENSION DE TOUTE NATURE = 25,685 lb/j

B. Calcul de la quantité totale de dépôts permis de DBO_5 par jour (Annexe B)

Conditions:

La quantité de DBO_5 permise pour la fabrication de la pâte mécanique blanchie doit être de 30 livres par tonne[1]. La quantité de DBO_5 permise pour la fabrication de papiers couchés, fins et à usages spéciaux doit être de 3 livres par tonne.[1]

1. Pâte non blanchie au bisulfite
   – cuisson 125 x 255 = 31,875 lb/j
   Pâte blanchie au bisulfite
   – cuisson $\frac{245 \times 54 \times 255}{49}$ = 68,850 lb/j
   – blanchiment 245 x 35 = 8,575 lb/j
2. Fabrication de pâte mécanique 400 x 30 = 12,000 lb/j
3. Fabrication de papiers couchés, fins et à usages spéciaux 98 x 3 = 294 lb/j

DÉPÔTS TOTAUX DE DBO_5 PERMIS PAR JOUR = 121,594 lb/j

1. L'annexe B n'indique pas les dépôts permis de DBO_5 pour les procédés de fabrication de pâte mécanique et de papier, à cause de la variabilité des données. Les chiffres mentionnés ci-dessus sont donc fictifs. Les chiffres réels pour chaque fabrique s'obtiendront par voie d'échantillonnage.

APPENDIX II

CALCULATION OF AMOUNT OF EFFLUENT REQUIRED FOR CONTINUOUS FLOW TEST

Assumptions

10, 5 gm. fish per test
Effluent contentration, 65 percent
90 percent replacement in 10 hours.
Duration of exposure – 96 hours

According to Sprague (1969)[1], the hourly rate of flow required for 90 percent replacement in 10 hours in a 20 litre tank is:

20/4.4 = 4.5 litres per hour

Amount of effluent required for one test at 65 percent concentration of 96 hours duration:

$$\frac{4.5 \times 96 \times 65 \times 0.22}{100} = 61.8 \text{ Imperial Gallons}$$

Amount of effluent required for 5 replicates at 65 percent concentration of 96 hours duration:

61.8 x 5 = 309 Imperial Gallons

CALCULATION OF AMOUNT OF EFFLUENT REQUIRED FOR STATIC TEST

Assumptions

10, 5 gm. fish per concentration
Effluent concentration, 65 percent
2 litres of solution per gm. of fish
Exchange the solution at the end of the 1st, 2nd and 3rd days (4 solutions).
Amount of effluent required for one test:

10x5x2x4x0.22=88 Imperial Gallons

1. Sprague, J.B., "Measurement of Pollutant Toxicity to Fish. Bioassay Methods for Acute Toxicity" Water Research, 1969, Vol. 3, pp. 793–821

APPENDICE II

CALCUL DE LA QUANTITÉ D'EFFLUENT NÉCESSAIRE AUX ESSAIS À DÉBIT CONTINU

Hypothèses

10 poissons de 5 g par essai
Concentration de l'effluent, 65 pour cent
Remplacement de 90 pour cent en 10 heures
Durée de l'essai – 96 heures

Au dire de Sprague (1969)[1], le taux horaire de débit permettant un remplacement de 90 pour cent en 10 heures dans un réservoir de 20 litres est de:

20/4.4 = 4.5 litres par heure

Quantité d'effluent requise pour un essai à une concentration de 65 pour cent sur une durée de 96 heures:

$$\frac{4.5 \times 96 \times 65 \times 0.22}{100} = 61.8 \text{ gallons impériaux}$$

Quantité d'effluent requise en vue de faire cinq (5) essais à une concentration de 65 pour cent d'une durée de 96 heures:

61.8 x 5 = 309 gallons impériaux

CALCUL DE LA QUANTITÉ D'EFFLUENT REQUISE EN VUE D'UN ESSAI STATIQUE

Hypothèses

10 poissons de 5 g chacun par concentration
Concentration de l'effluent, 65 pour cent
2 litres de solution par gramme de poisson
Remplacer la solution après le 1er, le 2ième et le 3ième jour (4 solutions).
Quantité d'effluent requise pour un essai:

10x5x2x4x0.22 = 88 gallons impériaux

1. Sprague, J.B. "Measurement of Pollutant Toxicity to Fish. Bioassay Methods for Acute Toxicity" Water Research, 1969, Vol. 3, p. 793 à 821.

REGULATIONS FILED UP TO MARCH 26, 1974

Environmental Protection Act, 1971

	Regulation No.	
Advisory Board	9	
Air Contaminants from Ferrous Foundries	11	
Air Contaminants from Motor Vehicles	12	
Air Contaminants from 1969 Model Motor Vehicles	13	
Evaporative Emissions from New Light Duty Motor Vehicles	14	
General	15	
Grants	16	
Sulphur Content of Fuels	17	
General	824	
Asphalt Paving Plants	183/72	May 6/72
Classes of Contaminants - exemptions	505/72	Oct. 28/72
Disposable Containers for Milk	368/72	Aug. 12/72
Disposable Paper Containers for Milk	533/72	Nov. 18/72
Pesticides	552/72	Dec. 9/72
Pesticides amended	119/73	Mar. 24/73
Deep Well Disposal	152/73	Apr. 7/73
Sulphur Content of Fuels amended	157/73	Apr. 7/73
Waste Management amending 824	217/73	Apr. 12/73
Derelict Motor Vehicles amending 824	382/73	June 20/73
Pesticides Codes amending 552/72	644/73	Oct. 17/73
Waste Management amending 824	75/74	Feb. 7/74

Ontario Water Resources Commission Act

Discharge of Sewage from Pleasure Boats	644	
Exemptions from Section 38	645	
Marinas	646	
Plumbing Code	647	
amended	344/71	Aug. 28/71
amended	209/72	May 20/72
Rate of Interest	107/71	Mar. 20/71
Water Wells	648	
Plumbing Code amended	158/73	Apr. 7/73

Pesticides Act

General	657	
amended	2/71	Jan. 16/71
amended	398/71	Oct. 2/71
amended	282/72	June 24/72
amended	550/72	Dec. 9/72
amended	553/72	Dec. 9/72
amended	564/72	Dec. 16/72
amended	120/73	Mar. 24/73

APPENDIX D

Statistical Series on Pulp and Paper Production in Ontario and Canada.

Price Indexes for Selected Pulp and Paper Products

1961 = 100

Year	Pulp & Paper Mills	Pulp: Bleached Kraft Export	Pulp: Bleached Sulfite Export	Pulp: Newsprint Export	Fine Paper	Paperboard: Containergrade Liner	Paperboard: Containergrade Corrugating
1948							
1949							
1950							
1951							
1952							
1953							
1954							
1955							
1956	97.7	104.5	112.0		89.3	100.6	97.5
1957	98.7	102.6	108.8		92.2	102.1	100.3
1958	99.7	105.2	109.3		93.7	101.4	100.4
1959	99.3	103.9	107.7		96.2	99.6	99.2
1960	99.6	103.5	106.4	100.0	98.2	100.7	100.1
1961	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1962	103.0	101.4	103.0	105.9	100.0	100.0	98.3
1963	103.6	101.0	102.4	107.0	100.7	100.1	96.7
1964	105.1	106.2	108.2	106.8	103.2	101.0	97.1
1965	105.9	111.1	112.2	106.7	104.1	101.0	97.3
1966	107.7	109.1	112.1	109.4	108.8	100.4	98.1
1967	110.2	108.0	112.2	112.7	114.5	101.2	100.6
1968	110.1	103.7	111.3	113.4	113.0	101.5	101.3
1969	113.6	106.6	114.3	117.2	117.8	103.0	102.4
1970	116.9	119.7	125.4	116.9	120.2	103.9	102.9
1971	117.1	118.2	122.0	116.4	122.4	104.9	102.9
1972 Avg.	118.1	110.8	118.0	119.5	125.3	107.8	102.8
" Mar.		112.8					
" Jne.		109.1					
" Sep.		109.0					
" Dec.		110.8					
1973 Jan.	120.4	115.0	122.2	120.7	130.7	111.9	100.9
Mar.	121.8	116.2	121.9	122.6	131.9	111.9	100.9
Jne.	126.0	128.8	133.2	123.2	140.9		99.8
Sep.	134.7	149.4	153.8	128.4	147.9		108.6
Nov.	145.	166.3	168.5	138.7	158.2		108.6
1974							

Estimated Capital Expenditure for the Canadian Pulp and Paper Industry.

	$000,000
1948	79.3
1949	71.8
1950	68.6
1951	108.9
1952	115.6
1953	91.9
1954	69.0
1955	118.3
1956	239.7
1957	234.4
1958	106.8
1959	102.2
1960	141.3
1961	138.4
1962	147.8
1963	181.6
1964	293.7
1965	383.8
1966	506.4
1967	418.5
1968	240.2
1969	325.7
1970	488.3
1971	491.0
1972	389.0

Canada Pulp Production and Consumption

000 Tons

Year	Mechanical	Sulfate (Kraft)	Sulfite	Other	Total Canada Production	Total Canada Consumption
1948						
1949						
1950						
1951						
1952						
1953						
1954						
1955					10150.5	7799.9
1956						
1957						
1958						
1959						
1960	5881	2442	2292		11461	8833.0
1961	5878	2697	2415		11779	
1962	5892	2926	2406		12133	
1963	5850	3136	2566		12474	
1964	6442	3420	2872		13741.8	10044.6
1965	6802	3787	2924	1060	14572.9	10679.3
1966	7351	4605	3066	936	15957.6	11699.1
1967	7041	5068	2827	921	15857.4	11413.5
1968	7055	6034	3643	747	16761.6	11634.7
1969	7680	6945	2794	1171	18589.9	12814.4
1970	7650	6707	2815	1136	18307.9	12771.5
1971	7405	7132	2527	1170	18233.6	12474.7
1972	7720	7747	2431	1113	18564.6	13086
1973					19827.4	

Source: Statistics Canada.

Total Shipments of Canadian Paper and Paperboard Products

000 Tons

Year	Newsprint	Printing and Fine Paper	Wrapping	Paperboard	Total Paper and Board Shipment
1948					
1949					
1950					
1951					
1952					
1953					
1954					
1955					
1956	6433	334	276	857	8283
1957	6317	330	270	822	8098
1958	5982	344	279	875	7871
1959	6371	372	317	917	8386
1960	6774	401	307	966	8826
1961	6675	417	315	1009	8792
1962	6648	434	330	1082	8924
1963	6639	460	340	1205	9160
1964	7378	491	349	1287	9984
1965	7841	535	367	1409	10617
1966	8493	621	419	1516	11520
1967	8108	627	465	1567	11269
1968	8205	663	467	1627	11540
1969	8863	731	505	1744	12486
1970	8764	880	491	1751	12480
1971	8420	906	542	1806	12352
1972	8963	1013	566	1992	13274
1973(1)	9030		630	2207	13469

(1) Estimated by CPPA

Ontario Pulp Production

000 Tons

Year	Mechanical	Sulfate (Kraft)	Sulfite	Other	Total
1948	1162	137	851	76	2226
1949	1109	411	561	57	2138
1950	1159	475	609	55	2298
1951	1208	521	679	67	2485
1952	1187	481	574	67	2309
1953	1175	506	578	65	2324
1954	1210	551	603	57	2421
1955	1275	591	459	79	2603
1956	1326	629	624	156	2735
1957	1334	643	629	140	2746
1958	1318	675	603	140	2736
1959	1353	701	585	119	2758
1960	1435	745	622	165	2967
1961	1432	738	614	197	3981
1962	1436	779	645	192	3052
1963	1417	817	666	174	3074
1964	1513	848	736	221	3318
1965	1539	848	746	224	3357
1966	1625	1038	707	217	3587
1967	1602	1122	689	206	3619
1968	1548	1238	653	205	3644
1969	1729	1328	700	204	3961
1970	1683	1368	703	215	3969
1971	1648	1321	628	203	3800
1972					3880.9
1973					3961.6

Source: Statistics Canada

Ontario Paper and Paper Board Production

000 Tons

Year	Newsprint	Fine Book & Writing	Paper Board	Wrapping	Tissue and Other	Total
1948	1198	146	396	53	44	1837
1949	1229	128	377	48	42	1819
1950	1240	138	417	63	46	1904
1951	1286	169	442	67	55	2019
1952	1297	153	408	57	49	1964
1953	1298	170	435	62	54	2019
1954	1346	177	421	69	55	2068
1955	1427	193	475	74	55	2225
1956	1472	224	508	74	60	2338
1957	1487	226	491	68	64	2336
1958	1465	234	516	71	69	2355
1959	1495	262	532	74	68	2431
1960	1608	266	538	74	64	2550
1961	1598	275	483	70	65	2491
1962	1602	292	524	72	67	2557
1963	1567	315	536	79	67	2564
1964	1714	323	579	84	69	2769
1965	1743	345	581	85.7	64.0	2819.1
1966	1849	431	542	86.7	73.9	2980.2
1967	1816	424.4	549	84.9	72.5	2946.5
1968	1760	448	556	92.0	97.9	2954.0
1969	1797	455	571	93.6	119.2	3006.4
1970	1858	533	593	70.6	124.1	3178.0
1971	1773	514	638	77.4	116.4	3119.0
1972	1783.6					3154.9
1973	1921.7					3474.9

Source: Statistics Canada

APPENDIX E

Comments by Murray German and John Ralston
of Ontario Ministry of the Environment
regarding the effects of pulp and paper mill effluents
on water quality under three alternative effluent conditions.

WATER QUALITY INFORMATION SHEET

Receiving Water: ABITIBI RIVER

Mills: Abitibi Paper Co. Ltd.

Location: Iroquois Falls

Existing Water Quality Information contained in: 1972 MOE Report and 1968 OWRC Report

Description of Water Quality:

Conditions in the Abitibi River below the Iroquois mill have been affected to a distance of approximately 40 miles. Noticeable changes in the aquatic life of the river are detectable to a distance of approximately 25 miles and water chemistry are detectable up to a distance of 40 or 50 miles. Access to the river below the mill is limited. There is very limited use of the river below the mill. There are no industries downstream from the mill. There are no water supplies located downstream from the mill. There are a number of hunting camps at the lower end of the river and in the 50-60 mile range at a distance of approximately 75 miles below there is a Hydro generating station which probably is not influenced by the mill discharge.

If the mill(s) were to be permanently closed down:

There would be a definite and immediate improvement in water quality conditions in the river, probably adequate to meet all water use requirements. For a number of years, however, the previous accumulation of wood fibre and bark would be a problem although these deposits would probably be scoured out of the river and be deposited in the Hydro dam at the 75 mile distance.

If the mill(s) were to meet existing M.O.E. effluent objectives:

of a reduction in BOD from 130,000 ppd to 15,000 ppd, there would also be an immediate improvement in water quality conditions acceptable or suitable for restoring all water use potentials of the river.

Are any additional waste treatment requirements suggested?

There are no additional waste treatment requirements that we would specify.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: BLACKBIRD CREEK, to MOBERLY BAY, LAKE SUPERIOR

Mills: Kimberly-Clark

Location: Terrace Bay

Existing Water Quality Information contained in: MOE Report of 1972

Description of Water Quality:

The flow in Blackbird Creek consists almost entirely of pulp mill effluent and for that purpose it is no longer considered to be a recoverable water course. The conditions in Moberly Bay include mainly aesthetic impairment, some slight foaming and colouration of the water. In addition to this there is b acterial contamination in excess of acceptable Ministry criteria at the mouth of Blackbird Creek. Also bottom fauna impairment or changes in the bottom fauna community have been demonstrated in Moberly Bay.

If the mill(s) were to be permanently closed down:

There would be no improvement in conditions in Blackbird Creek. However, the aesthetic problems in Moberly Bay would be improved and in general it would be anticipated that water quality conditions would rapidly be restored to an acceptable level.

If the mill(s) were to meet existing M.O.E. effluent objectives:

Similarly, it is anticipated that satisfactory water quality conditions would be restored in Moberly Bay.

Are any additional waste treatment requirements suggested?

There are no additional effluent requirements.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: DUSCHENAY CREEK - LAKE NIPISSING

Mills: Canaidan Johns-Manville Co. Ltd.

Location: North Bay

Existing Water Quality
Information contained in: The only available information relative to this discharge is water quality monitoring data. We have no information relative to the effects of this discharge on the Creek or on Lake Nipissing. However, the Creek will be surveyed next summer in conjunction with Lake Nipissi

Description of Water Quality:

A review of our water quality monitoring data above and below the discharge from this pulp mill to the Creek suggest that there is no measurable effect on water quality.

If the mill(s) were to be permanently closed down:

It is not suspected that this would result in any significant improvement in water quality of the Creek or of Lake Nipissing.

If the mill(s) were to meet existing M.O.E. effluent objectives:

This would be adequate from a water quality point of view.

Are any additional waste treatment requirements suggested?

We have no additional effluent objectives that we would specify for this mill.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: EAST RIVER

Mills: Kimberly-Clark

Location: Huntsville

Existing Water Quality Information contained in: MOE Report of 1973

Description of Water Quality:

There are no water quality problems in the East River associated with this waste discharge.

If the mill(s) were to be permanently closed down:

There would be no noticeable improvement in water quality conditions.

If the mill(s) were to meet existing M.O.E. effluent objectives:

The mill is currently meeting MOE objectives.

Are any additional waste treatment requirements suggested?

We have no additional requirements for this mill.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: KAPUSKASING RIVER

Mills:
(1) Spruce Falls Power and Paper Co. Ltd.
(2) Kimberly-Clark of Canada LTD.

Location: Kapuskasing

Existing Water Quality Information contained in: File report of the Water Quality Branch relating to surveys of the river undertaken in 1970.

Description of Water Quality:

The main problem in the river is primarily one of dissolved oxygen depression with drastic reductions reaching a peak of anoxic conditions at a distance of 40 miles below the pulp mill. In addition to the dissolved oxygen depression, the river also has areas of fibre and bark deposit.

If the mill(s) were to be permanently closed down:

If both mills were to close, we would anticipate that immediate response in water quality conditions and restoration of satisfactory water quality conditions.

If the mill(s) were to meet existing M.O.E. effluent objectives:

Satisfactory water quality conditions would materialize.

Are any additional waste treatment requirements suggested?

We have no additional effluent requirements for the two mills.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: MATTAGAMI RIVER

Mills: Abitibi Paper Co. LTD.

Location: Smooth Rock Falls

Existing Water Quality Information contained in: the Water Quality Branch files covering a distance of 35 miles below the mill.

This was a preliminary assessment and additional work will be done next year.

Description of Water Quality:

The mill is affecting conditions in the river to a distance of approximately 30 miles downstream from the effluent. Primarily the effect is one of depressed dissolved oxygen. There are minor problems of suspended solids, build-ups of wood fibre and bark downstream from the mill. Additionally, the mill is a kraft mill and as a result there have been reports of tainting of fish flesh.

If the mill(s) were to be permanently closed down:

It is anticipated that water quality conditions in the river would be improved significantly. The bark and fibre accumulations in the river would probably disappear or be transferred downstream in a fairly short period of time owing to the swift flow in the river. The tainting of fish flesh would also rapidly disappear.

If the mill(s) were to meet existing M.O.E. effluent objectives:

The current MOE requirements pertain only to a reduction in suspended solids from 17 Tpd to 213 Tpd. Meeting this requirement would do nothing to improve the dissolved oxygen conditions in the river.

Are any additional waste treatment requirements suggested?

Following the work to be done on the river next year we will wish to recommend a reduction in BOD - this reduction will be required to produce satisfactory water chemistry conditions within the river. If it can be documented that tainting of fish flesh is a problem in the river it will also be necessary for the mill to reduce this problem through technology which is currently being developed.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973)

WATER QUALITY INFORMATION SHEET

Receiving Water: NAPANEE RIVER

Mills: Strathcona Paper Co. Ltd.

Location: Strathcona

Existing Water Quality Information contained in:

Water quality information pertaining to this waste discharge was collected during the summer of 1973 and is currently being analyzed.

Description of Water Quality:

The main problem associated with this mill is depression in dissolved oxygen immediately downstream from the mill, however this is not a serious problem.

If the mill(s) were to be permanently closed down:

The minor dissolved oxygen problem in the Napanee River would be immediately solved.

If the mill(s) were to meet existing M.O.E. effluent objectives:

(as specified in the Turner Report) the BOD problem would still persist.

Are any additional waste treatment requirements suggested?

Therefore, additional treatment will be required in the form of an aerator in the file cell of the lagoon system which will undoubtedly overcome the dissolved oxygen problem in the Napanee River.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: LAKE GIBSON to MARTINDALE POND to LAKE ONTARIO

Mills: Beaver Wood Fibre Co. Ltd.

Location: near Thorold

Existing Water Quality Information contained in: the Water Quality Branch files (information gathered during 1973)

Gibson Lake is an alternative water supply for the city of St. Catharines.

Description of Water Quality:

The discharge from Beaver Wood Fibre is affecting Lake Gibson in the immediate vicinity of the discharge by the accumulation of wood fibres and in turn the benthic oxygen demand associated with these wood fibres is affecting the chemical quality of Gibson Lake.

If the mill(s) were to be permanently closed down:

It is not anticipated that there would be any immediate improvement in water quality. The existing fibre deposits off the discharge from the mill would not be scoured and would remain for a considerable period of time. The benthic oxygen demand associated with these fibres would also persist for a considerable period of time.

If the mill(s) were to meet existing M.O.E. effluent objectives:

of a reduction in suspended solids from 10.8 Tpd to 1.1 Tpd there would not be any immediate improvement in water quality, however over the long term this would result in a reduction of suspended solids and would in the long run result in some improvement in the chemical condition of Gibson Lake.

Are any additional waste treatment requirements suggested?

From a preliminary review of our 1973 survey of Gibson Lake it would appear that we will not be requiring any additional waste treatment at the Beaver Wood Fibre Co. Ltd.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: OLD WELLAND CANAL, to 12 MILE CREEK to MARTINDALE POND to LAKE ONTARIO

Mills: Abitibi Forest Products Ltd.- Provincial Paper Division, Domtar Fine Papers Ltd, Domtar Construction Materials, Kimberly Clark, Ontario Paper Co. Ltd. (5mills)

Location: THOROLD

Existing Water Quality Information contained in: . an unpublished report from 1970 which is on file in the Water Quality Branch. plus nine years of water quality monitoring records. The effects for these waste discharges are primarily confined to the Old Welland Canal.

Description of Water Quality:

The effects of these waste discharges is such that there is no possible use of the river aside from the waste receiver. The discharge from the Welland Canal as it reaches 12 Mile Creek receives sufficient dilution from the 12 Mile Creek that the effects from the pulp mill discharges are difficult to distinguish in terms of water chemistry. The wood fibres from the pulp mill do accumulate in Martindale Pond. As a result of the deposition of wood fibre the benthic oxygen demand of the decaying wood fibre is exerting a draw on the oxygen supply of Martindale Pond to the extent that dissolved oxygen levels in the Pond are becoming marginal for aquatic life. The effects of the pulp mill discharges from Thorold on water quality of Lake Ontario . . . see over

If the mill(s) were to be permanently closed down:

The Old Welland Canal would be dried up. The total flow in the Canal is pulp mill effluent. The effects on 12 Mile Creek and Martindale Pond - it is anticipated that if the mills were to close down conditions would be improved significantly in a relatively short period of time, in a matter of years. The fibre deposits at the bottom of Martindale Pond would probably be covered over by silt and the benthic oxygen demand thereby reduced.

If the mill(s) were to meet existing M.O.E. effluent objectives:

This would still not result in any increased benefit of the Old Welland Canal since the Canal consists of the effluent from the Thorold pulp mills. The effects in 12 Mile Creek and Martindale Pond, however, would probably improve to a certain extent and it is anticipated that we would be able to measure a slight improvement in the chemical quality of Martindale Pond.

Are any additional waste treatment requirements suggested?

We would not specify any additional waste treatment requirements.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

are unknown at this time. It is possible that there are effects in Lake Ontario but we do not have any information to substantiate this.

WATER QUALITY INFORMATION SHEET

Receiving Water: NIPIGON BAY, LAKE SUPERIOR

Mills: Domtar Packaging Ltd.

Location: Red Rock

Existing Water Quality Information contained in: 1968 OWRC Report on Nipigon Bay

Description of Water Quality:

The known effects of this discharge relate primarily to tainting of fish flesh. The mill effluent also poses a problem in terms of aesthetic conditions in Nipigon Bay. There is no effect on dissolved oxygen conditions in Nipigon Bay that has been documented to date. The tainting of fish felsh is a problem in the immediate vicinity of the discharge and has resulted in market rejections of commercial fish catches and the closure of the fishery.

If the mill(s) were to be permanently closed down:

It is anticipated that the fish tainting would disappear within a very short period of time, probably within a year or so. The aesthetic problem would also be overcome.

If the mill(s) were to meet existing M.O.E. effluent objectives:

This would not ensure a solution to the problem of tainting of fish flesh. However, the reductions in dissolved solids and BOD could possibly result in a slight change and improvement in water quality conditions.

Are any additional waste treatment requirements suggested?

We would definitely specify that the mill will have to overcome its fish tainting problem and in this regard the mill is working on new technology to overcome the fish tainting problem.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: OTTAWA RIVER

Mills: Canadian International Paper Co.

Location: Hawkesbury

Existing Water Quality Information contained in: Ottawa River Basin Report 1970

Description of Water Quality:

The effects of the mill are probably best defined in the Ottawa River Report and we will not attempt to cover them at this time.

If the mill(s) were to be permanently closed down:

There would definitely a measurable improvement in water quality conditions of the Ottawa River particularly the dissolved oxygen parameter.

If the mill(s) were to meet existing M.O.E. effluent objectives:

If the mill were to meet the MOE effluent objectives we would also anticipate that there would be a measurable improvement in water quality conditions in the river. This improvement as in the previous case, with the total closing of the mill, would not necessarily be immediate however, in a matter of years we would anticipate that there would be a measurable improvement of water quality.

Are any additional waste treatment requirements suggested?

At this time we could not specify any additional waste treatment requirements at the Hawkesbury mill.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: OTTAWA RIVER

Mills: E. B. Eddy Co.

Location: Ottawa

Existing Water Quality Information contained in: Ottawa River Report

Description of Water Quality:

Relative to the other waste discharges to the Ottawa River, the contribution of wastes from the E. B. Eddy Co. at Ottawa is so insignificant that it is difficult to distinguish the effect of this waste relative to those of the other discharges to the river.

If the mill(s) were to be permanently closed down:

Therefore, it is not likely that it would be possible to measure any change in water quality in the river.

If the mill(s) were to meet existing M.O.E. effluent objectives:

It would also be likely very difficult to measure this improvement in the river itself.

Are any additional waste treatment requirements suggested?

We would therefore not offer any additional suggestions to other treatment requirements.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: PENINSULA HARBOUR, LAKE SUPERIOR

Mills: American Can

Location: Marathon

Existing Water Quality Information contained in: MOE Report of 1972

Description of Water Quality:

The problems associated with the Marathon mill are primarily aesthetic problems associated with the plume discolouration of the water and foaming. There are also relatively high bacteriological counts. Some accumulations of organic matter in the sediments and as a result, minor alterations in the bottom fauna community.

If the mill(s) were to be permanently closed down:

There would be an immediate solution to the aesthetic problem at the mill.

If the mill(s) were to meet existing M.O.E. effluent objectives:
(as specified in the Turner Report) it is anticipated that little change in water quality conditions would materialize in the receiving water. The discolouration and foaming problems would probably still persist at this site.

Are any additional waste treatment requirements suggested?

The only additional effluent requirement that we might specify would be a diffuser outfall which would certainly overcome the discolouration problem and the foaming problem.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: RAINY RIVER

Mills: Ontario Minnesota Pulp and Paper Co.

Location: Fort Frances

Existing Water Quality Information contained in: IJC Reports pertaining to the Rainy River. The latest report is 1970.

Description of Water Quality:

Water quality conditions in the river include dissolved oxygen depression, accumulations of wood fibre and bark in the river and there have been several reports of tainting of fish flesh. High bacterial counts are also encountered in the river. Relative to this pulp mill, the mill on the Canadian side is currently meeting the MOE effluent objectives and the problems that exist in the river are primarily related to the pulp mill on the American side of the river.

If the mill(s) were to be permanently closed down:

It is not anticipated that this would result in any significant change in water quality conditions in the Rainy River.

If the mill(s) were to meet existing M.O.E. effluent objectives:

The pulp mill on the Canadian side is currently meeting MOE objectives and no additional requirements are suggested for this mill. It is anticipated that one the mill on the American side of the river meets the objectives that have been set down for it, satisfactory water quality conditions will be restored in the Rainy River.

Are any additional waste treatment requirements suggested?

No (see above)

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: SPANISH RIVER

Mills: Eddy Forest Products

Location: Espanola

Existing Water Quality Information contained in: 1972 MOE Report of Water Quality Conditions in the Lower Spanish River and an earlier Biological Survey Report

Description of Water Quality:

The river chemical biological conditions are degreaded for the entire length of the river from the mill to the North Channel of Lake Huron, a distance of 32 miles. This includes dissolved oxygen depression and to a limited extent problems associated with fibre and bark deposition and also fish tainting problems have been experienced and the commerical fishery of the North Channel has been affected. The Spanish River also has strong odour emanating from it.

If the mill(s) were to be permanently closed down:

We would anticipate a very marked improvement in water quality conditions immediately in the river.

If the mill(s) were to meet existing M.O.E. effluent objectives:

The water quality conditions would probably be compatible with normal uses of the basin except for the tainting problem, which will probably require some additional degree of treatment.

Are any additional waste treatment requirements suggested?

Pertaining to the fish tainting problem, it is not likely that the treatment provided to meet MOE requirements would reduce tainting of fish flesh and it will probably be necessary to provide some additional degree of treatment to overcome tainting problems.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: ST. LAWRENCE RIVER

Mills: Domtar Fine Paper Ltd.

Location: Cornwall

Existing Water Quality Information contained in: IJC Lower Great Lakes Water Quality Report plus additional information contained in Water Quality Branch files relative to localized surveys of the pulp mill discharge.

Description of Water Quality:

One of the alleged effects from this discharge includes tainting of fish flesh. In conjunction with this problem the pulp mill has carried out research through a big consulting firm to assess the sources of tainting and recommend treatment requirement.

If the mill(s) were to be permanently closed down:

The tainting problem, if in fact it does relate to the mill discharge, would certainly be overcome. Owing to the flow in the St. Lawrence River it is unlikely that significant changes in the water chemistry condition of the river would materialize.

If the mill(s) were to meet existing M.O.E. effluent objectives:

It is not anticipated that there would be any measurable water quality effects downstream from the mill aside from the tainting problem.

Are any additional waste treatment requirements suggested?

We would specify that it would be necessary for the mill to overcome the fish tainting problem.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: ST MARY'S RIVER

Mills: Abitibi Paper Co. Ltd.

Location: Sault Ste Marie

Existing Water Quality Information contained in: the IJC Interconnecting Waters Monitoring Data.

Also in a Biological Survey Report on the river undertaken in 1967

Description of Water Quality:

This information is summarized in an OWRC Report and known effects include fibres and deposits and probably transboundary movement of fibre deposits. Concerning loadings from the mill and the available dilution in the St. Marys River, it is probable that the effects on water chemistry are minimal.

If the mill(s) were to be permanently closed down:

It is not likely that there would be any immediate change in water quality conditions which could be detectable.

If the mill(s) were to meet existing M.O.E. effluent objectives:

There are no M.O.E. requirements, aside from the suspended solids reduction from 16 Tpd to 3.9 Tpd. Should the mill meet these requirements this would probably be adequate to protect the water quality conditions in the river.

Are any additional waste treatment requirements suggested?

Therefore there are no additional requirements.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: STURGEON RIVER - LAKE NIPISSING

Mills: Abitibi Forest Products Ltd.

Location: Sturgeon Falls

Existing Water Quality Information contained in: Water quality data below this mill is limited. We have water quality monitoring data for a station on the Sturgeon River for the past 7 years.

Description of Water Quality:

At the present time, we have no detailed knowledge of the effects from the Abitibi Forest Products discharge to the river. In conjunction with studies that are underway on Lake Nipissing it is anticipated that some investigation of water quality in the Sturgeon River will be undertaken during 1974.

If the mill(s) were to be permanently closed down:

Owing to the lack of knowledge of the effects of this discharge on the Sturgeon River, we are not in a position to comment on Items 1, 2, or 3.

If the mill(s) were to meet existing M.O.E. effluent objectives:

Are any additional waste treatment requirements suggested?

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: KAMINISTIKWIA RIVER , THUNDER BAY

Mills: Great Lakes Paper Co.

Location: Thunder Bay

Existing Water Quality Information contained in: 1967 Biological Survey Report of Thunder Bay and the Kaministikwia River

plus the Thunder Bay Regional Water Quality Survey Report of 1972

Description of Water Quality:

The most pronounced effects of this mill is a drastic reduction in dissolved oxygen conditions within the Kam River to the point of anoxic conditions. The change in water quality extends throughout the 6 miles of the Kam River below the kraft mill discharge and extends for a distance into Thunder Bay off the mouth of the Kam River. In addition to the kraft mill discharge to the river, there are domestic waste discharges to the river and other industrial waste discharges. However, the primary source of waste discharge to the river is the Great Lakes Paper Co.

If the mill(s) were to be permanently closed down:

It is anticipated that there would be an immediate improvement in water quality particularly with regard to dissolved oxygen conditions in the River, but also a general improvement in water quality conditions, including colour, and suspended solids content.

If the mill(s) were to meet existing M.O.E. effluent objectives:

(as stated in the Turner Report) on the basis of available information this would not restore dissolved oxygen conditions in the River to our receiving water conditions.

Are any additional waste treatment requirements suggested?

Therefore under this question, additional reductions in BOD would be essential in order to totally restore dissolved oxygen condtions to the extent required for other water uses, particularly protection of fish and aquatic life.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: THUNDER BAY

Mills: Abitibi Forest Products Ltd. - Port Arthur Mill

Location: Thunder Bay

Existing Water Quality Information contained in: MOE Report of 1972 and OWRC Report of 1967.

Description of Water Quality:

It is possible that the discharge from this mill is contributing to the water quality problems of the Bear Point intake for the city of Thunder Bay. It is also possible that the suspended solids being discharged from the mill are contributing to the bark accumulations along the shoreline of Thunder Bay to the north-east of the city. It is not felt that the BOD being discharged by the mill is significantly affecting the water chemistry of Thunder Bay.

If the mill(s) were to be permanently closed down:

It is possible that if the mill were affecting the water quality of the Bear Point intake and also contributing to the fibre accumulations along the north-east shore of Thunder Bay, that these conditions would be improved. The water chemistry and the aquatic life of Thunder Bay in the vicinity of the mill would probably not be altered.

If the mill(s) were to meet existing M.O.E. effluent objectives:

It is probable that there would be no water quality degredation in the receiving water and that suitable use would be possible.

Are any additional waste treatment requirements suggested?

There are no additional effluent objectives we would specify. It is probable that the MOE requirement - reduction of BOD from 60,000 ppd to 12,000 ppd - would not result in any detectable or measureable improvement in chemical conditions in Thunder Bay.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: THUNDER BAY

Mills: Abitibi Paper Co. Ltd.
Fort William Mill

Location: Thunder Bay,

Existing Water Quality Information contained in: 1972 MOE Report and 1967 OWRC Report. Additional data in MOE files

Description of Water Quality:

Effects from the discharge of this mill are difficult to distinguish. Possibly there is a localized effect on the Ontario Hydro Thermal Generating Plant intake at the mouth of the Mission Channel adjacent to the Abitibi Pulp Co. discharge. There is also a possibility that the mill discharge may be contributing to a water contamination problem for the water supply for the Indian reserve in the vicinity of Chippewa Park.

If the mill(s) were to be permanently closed down:

loadings of BOD, suspended solids would be reduced to zero and toxicity problems, if they exist at the mill, would be eliminated. In terms of improving the water quality conditions along the south-eastern shoreline of Thunder Bay, an appreciable change in water quality conditions would not likely materialize.

If the mill(s) were to meet existing M.O.E. effluent objectives:

it probably would be difficult to identify an improvement in water quality conditions as a result ot BOD reductions from 50,000 ppd to the requirement of 10,000 ppd.

Are any additional waste treatment requirements suggested?

No suggestions.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: THUNDER BAY HARBOUR

Mills: Abitibi Forest Products Ltd.
Provincial Paper Division

Location: Thunder Bay

Existing Water Quality Information contained in: MOE Report 1972
OWRC Report 1967

Description of Water Quality:

The most pronounced effect from the discharge of the Provincial Paper Division mill is that of suspended solids accumulating in the north-eastern portion of Thunder Bay Harbour. It is also probable that there is a change in the phytoplankton production, in increase in phytoplankton production, in that portion of the harbour resulting from the pulp mill discharge. Additionally, there is a depression in dissolved oxygen conditions that can be attributable to the pulp mill discharge.

If the mill(s) were to be permanently closed down:

It is very difficult to predict what the effect might be. The dissolved oxygen conditions may improve, however the oxygen demand from the previous accumulations of wood fibre in that portion of the bay which may continue to affect the dissolved oxygen levels. Certainly the deposited wood fibre and bark would remain at that location for a considerable period of time.

If the mill(s) were to meet existing M.O.E. effluent objectives:

(as specified in the Turner Report) there could possibly be a slight improvement in dissolved oxygen conditions in the portion of the harbour which receives the mill discharge.

Are any additional waste treatment requirements suggested?

We would not specify any additional waste treatment requirements.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: TRENT RIVER

Mills: Domtar Packaging Ltd.

Location: Trenton

Existing Water Quality Information contained in: Unreported survey findings plus water quality monitoring information. Most of this information was collected prior to recent changes in the waste treatment at the pulp mill and so we do not have any up to date information on the current effects of this discharge to the river.

Description of Water Quality:

With the recently installed holding lagoons and waste treatment system at this mill it is anticipated that we will not be able to measure a change in water quality downstream from the mill.

If the mill(s) were to be permanently closed down:

We would not anticipate any further improvement in water quality.

If the mill(s) were to meet existing M.O.E. effluent objectives:

We are satisfied that the MOE effluent objectives for this industry are adequate.

Are any additional waste treatment requirements suggested?

We would not require any additional waste treatment.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: TRENT RIVER

Mills: Miller Bros. Co. Ltd.

Location: Glen Miller

Existing Water Quality Information contained in: We have little water quality information available relative to this pulp mill.

Description of Water Quality:

The only known problems are foaming problems and turbidity problems and water discolouration downstream from the effluent.

If the mill(s) were to be permanently closed down:

It is anticipated that there would be an improvement in the aesthetic quality of the river and possibly elimination of the foaming problem dowstream.

If the mill(s) were to meet existing M.O.E. effluent objectives:

It is anticipated that suitable water quality conditions would be attained.

Are any additional waste treatment requirements suggested?

We have no additional effluent objectives for this mill.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: WABIGOON RIVER

Mills: Dryden Paper Co. LTD.

Location: Dryden

Existing Water Quality Information contained in: OWRC Reports of 1969 and 1970

Description of Water Quality:

The effects of this mill include accumulations of fibre and bark deposits within the Wabigoon River, tainting of fish flesh. An additional problem associated with the Dryden Paper discharge is the aesthetic problem associated with foaming in the Wabigoon River which is quite evident at most of the highway crossings of the river.

If the mill(s) were to be permanently closed down:

The reduction in loadings to the river would not result in an immediate improvement of water quality or restoration of additional water uses. It would probably be decades before the accumulation of fibre deposits in the river would be eliminated. The total closure of the mill however would probably result in some improvement of water quality in the lower portion of the river and probably would overcome the fish tainting problem.

If the mill(s) were to meet existing M.O.E. effluent objectives:

(as stated in the Turner Report) it is unlikely that we would have a significant improvement in water quality conditions. Were the discharge to be reduced to a greater extent than the MOE requirements it is possible that there might be a slight improvement in the chemical condition of the river however the accumulation of fibre deposits and associated benthic oxygen demand would still exert a considerable influence on water quality conditions for a period of many years.

Are any additional waste treatment requirements suggested?

In addition to meeting the MOE effluent objectives it is possible that a stream flow diversion around the area of the river containing the majority of the fibre deposits or possibly dredging of the deposits of the river could result in some marginal improvement of water quality conditions in the Wabigoon River.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

WATER QUALITY INFORMATION SHEET

Receiving Water: WINNIPEG RIVER

Mills: Ontario-Minnesota Pulp and Paper Co.

Location: Kenora

Existing Water Quality Information contained in: 1968 Biological Survey Report

Description of Water Quality:

The water quality problems in the Winnipeg River are primarily aesthetic problems associated with the effluent and the accumulation of wood fibre deposits which are affecting the aquatic life of the river. The information available suggests that there is no alteration in the dissolved oxygen conditions of the river.

If the mill(s) were to be permanently closed down:

Immediate solution to the aesthetic problem associated with the effluent would materialize. However, the sludge banks and fibre deposits in the river would probably persist for a number of years.

If the mill(s) were to meet existing M.O.E. effluent objectives:

It is anticipated that water quality conditions would be acceptable for normal water use.

Are any additional waste treatment requirements suggested?

We have no additional effluent requirements for this mill.

(The above information was prepared by Murray German - Biologist, Water Quality Branch, M.O.E. - in response to a questionnaire from the Policy Analysis Section of the Strategic Planning Branch. December 14, 1973.)

APPENDIX F

Uses of each water body which receives pulp and paper effluents.

Mill(s): Abitibi Paper Co. Ltd

LOCATION: - ABITIBI RIVER Study 1968-67
Downstream from Iroquois Falls

	Upstream	Downstream
DOMESTIC WATER SUPPLY	for the communities of Ansonville & Montrock	for Iroquois Falls
INDUSTRIAL WATER SUPPLY	- transportation & storage of pulp logs from the cutting grounds to the mill site	- flow controlled by Abitibi Power & Paper - they ust 24ml gal/day from River
RECREATION Swimming Boating Fishing Game/Forage	- proposed downstream land use plans include recreational development	-not utilized extensively for recreation(probably never was) some hunting, fishing, trapping -some boating on lower reaches of study area (70 miles?)
COMMERCIAL FISHING		sturgeon - perhaps 70mi d.s.
HYDRO POWER	Twin Falls - owned by Abitibi	Iroquois Falls)owned by Island Falls)Abitibi Abitibi Canyon-Ontario
WASTE DISPOSAL Municipal Industrial Other	Municipal Industrial	Iroquois Falls - sanitary wastes; Ansonville Montrock sanitary wastes; - discharged without treatment to river (pop.of towns 6,000) Abitibi - no treatment except for some solids removal 24ml gal/day
OTHER RECREATIONAL WATER AVAILABLE		Yes
COMMENTS		see Glackmayer Report of Multiple Land Use Planning for Cochrane Clay Belt -involves potential uses for area.
OTHER		

Mill(s):

LOCATION: - DUSCHENAY CREEK :Study 1965
Lake Nipissing (Town: North Bay)

	Upstream	Downstream
DOMESTIC WATER SUPPLY	- City of North Bay takes its water from nearby Trout Lake	
INDUSTRIAL WATER SUPPLY		
RECREATION Swimming Boating Fishing Game/Forage	- Lake Nipissing heavily used for recreation including fishing, boating, swimming	
COMMERCIAL FISHING		
HYDRO POWER		storm sewers principle source of pollution to Lake Nipissing
WASTE DISPOSAL Municipal Industrial Other		treated municipal wastes to Lake Nipissing -several industries (mill not mentioned) were discharging raw or inadequately treated wastes to Lake Nipissing
OTHER RECREATIONAL WATER AVAILABLE	Yes	Yes
COMMENTS		
OTHER		

Mill(s): Kimberly Clark Tissue Mill

LOCATION: - East River Study 1973 (Huntsville) Addendum

	Upstream	Downstream
DOMESTIC WATER SUPPLY		
INDUSTRIAL WATER SUPPLY	For Kimberly - Clark 2mgd	
RECREATION Swimming Boating Fishing Game/Forage		
COMMERCIAL FISHING		
HYDRO POWER		
WASTE DISPOSAL Municipal Industrial Other		Kimberly-Clark 0.5 mgd. (Highly sophisticated waste treatment system) the mill
OTHER RECREATIONAL WATER AVAILABLE		is not altering the quality of downstream waters.
COMMENTS	East River is north of the town of Huntsville & drains into Lake Vernon which is west of Huntsville	
OTHER		

Mill(s): Eddy Forest Products Ltd LOCATION: - Lower Spanish River Town Espanola Study 1972

	Upstream	Downstream
DOMESTIC WATER SUPPLY		In study area only about 40 people in a small settlement obtain their water from the river. Espanola uses water from Lake Apsey - other nearby towns get water from tributaries or private wells
INDUSTRIAL WATER SUPPLY	process drinking water for Eddy F.P. at Espanola	unlikely - (only 1 small town 'Spanish' - before river reaches North Channel - Lake Huron)
RECREATION Swimming Boating Fishing Game/Forage	Excellent potential for recreation (tourism) - very scenic area proximity to large growth (Sudbury) centres and transportation routes.	At present little recreational use made of river because of its pollted state. - downstream polluted water prevents swimming & reverside recreations
COMMERCIAL FISHING		- in the North channel (drainage sink of the river) fishermen who caught from mouth of the river have had trouble selling their catches.
HYDRO POWER	- upstream 5 hydro g.s. (4- International Nickel 1 owned by Eddy F.P.)	Since domestic wastes are unchlorinated they are the main source of contamination to the river p. 23
WASTE DISPOSAL Municipal Industrial Other	process waste waters from Eddy F.P. into river 26.6 mgd -company installing some controls on waste	- domestic wastes (treated, not chlorinated) from Espanola (pop 6,000) 6660,000 gd. 1/2 mile downstream - possible seasonal discharge from town of Webbwood
OTHER RECREATIONAL WATER AVAILABLE	Yes	Yes
COMMENTS	streamflow - mean 4,500 cfs summer low - 1,200 cfs	
OTHER		

Mill(s):

LOCATION: - see comments

1970 Study

	Upstream	Downstream
		A 1973 study is coming from the Lab.
DOMESTIC WATER SUPPLY	Town's water supply from Hunter's Bay	
INDUSTRIAL WATER SUPPLY		
RECREATION Swimming Boating Fishing Game/Forage	Economy of town relies heavily on tourist industry boating, swimming, water sports & fishing facilities	
COMMERCIAL FISHING		
HYDRO POWER		
WASTE DISPOSAL Municipal Industrial Other	Municipal waste (treated) discharged to Muskoka River. However, relatively large quantities of domestic sewage are gaining access to M.R.via sanitary, storm sewers & drainage ditch outfalls.	some industrial wastes discharged to Muskoka R. others to sanitary sewers none appear to pollute over the level deemed damaging by O.W.R.C.
OTHER RECREATIONAL WATER AVAILABLE		
COMMENTS	Water bodies mentioned were Fairy Lake, Lake Vernon & Muskoka River and Hunter's Bay	
OTHER	At the time of the study the Kimberly -Clark plant had not been constructed - it was to be located west of the town.	there is no mention made of the East River

Mill(s): Kimberly-Clark

LOCATION: - Jackfish Bay (Town:Terrace Bay)
(Lake Superior) Study - 1969

	Upstream	Downstream
DOMESTIC WATER SUPPLY		
INDUSTRIAL WATER SUPPLY		Yes
RECREATION Swimming Boating Fishing Game/Forage		
COMMERCIAL FISHING		
HYDRO POWER		
WASTE DISPOSAL Municipal Industrial Other		Ind: - Daily 20 mil. gal waste water
OTHER RECREATIONAL WATER AVAILABLE	Yes	Yes
COMMENTS		-aesthetic problem Trans-Canada highway passes the polluted stream system at 3 points (foam & Colouration evident)
OTHER		

Mill(s): Kimberly-Clark (1) LOCATION: - Kapuskasing River
Spruce Falls Power & Paper Co Ltd (Town: Kapuskasing) WATER USES:

	Upstream	Downstream
DOMESTIC WATER SUPPLY	I assume that domestic water supply is provided from this river for town of Kapuskasing	- there are no towns downstream
INDUSTRIAL WATER SUPPLY	storage & transportation of pulp logs	both companies use a combined total of 43 mgd
RECREATION Swimming Boating Fishing Game/Forage	limited sprot fishing is done in the river above Kapuskasing	downstream, recreational use of the river is virtually non-existent large concentrations of waterfowl attract few hunters (doesn't say why) no fishing
COMMERCIAL FISHING		N O
HYDRO POWER	Spruce Falls Dam in Kapuskasing	
WASTE DISPOSAL Municipal Industrial Other	No municipal waste disposal upstream	both companies discharge combined total of 43 mgd into the river
OTHER RECREATIONAL WATER AVAILABLE	Yes, but may not be accessible by road.	
COMMENTS	Kapuskasing River flows north - downstream about 40 miles from town of Kapuskasing, it joins the Matagami River, which in turn joins Moose River which empties into James Bay (Pop. of Kapuskasing -12,500 (1968)	
OTHER	Report concentrates exclusively on pulp & paper mills - does not mention municipal waste disposal though I think it is likely that the river is also used for this purpose.	

Mill(s): Strathcona Paper Co. LOCATION: - Napanee River Study done 1961
(Town: Strathcona)

	Upstream	Downstream
	(A 1968 study coming from the Lab)	
DOMESTIC WATER SUPPLY	at communities upstream from Napanee, water is supplied from private wells.	- source of municipal water supply for town of Napanee
INDUSTRIAL WATER SUPPLY		- Strathcona Paper Co, Lt. uses water
RECREATION Swimming Boating Fishing Game/Forage	Says "is of considerable (U&D) importance" - does not elaborate	
COMMERCIAL FISHING		
HYDRO POWER		
WASTE DISPOSAL Municipal Industrial Other	Receiving water body for municipal sewage treatment plant effluent of Napanee (town) -Strathcona P. C. - wastes discharged to a series of waste stabilization ponds & then to river - also sanitary wastes from plant.	As of 1961 - Unsatisfactory treatment of municipal discharges into river (D.S.) Also Newbrugh Milk Products Ltd. discharges wastes to a tributary of the river
OTHER RECREATIONAL WATER AVAILABLE		
COMMENTS		downstream from town of Napanee (and from Strathcona) the river has been employed for navigation purposes
OTHER	Napanee River System drains 316.3 sq. miles empties into Bay of Quinte GreatestLength - 32 miles Greatest Width - 18 miles	

Mill(s): Niagara Region

LOCATION: - Old Welland Canal (also called industrial wastes drain)

	Upstream	Downstream
DOMESTIC WATER SUPPLY		
INDUSTRIAL WATER SUPPLY		due to badly degraded water quality, it is
RECREATION Swimming Boating Fishing Game/Forage		highly unlikely that any of these uses are possible
COMMERCIAL FISHING		
HYDRO POWER		
WASTE DISPOSAL Municipal Industrial Other	- 6 paper mills discharge industrial wastes	- see back (NACR p.16)
OTHER RECREATIONAL WATER AVAILABLE		
COMMENTS		
OTHER		

Mill(s):

LOCATION: -

Also Niagara Conservation Authority Study 1964 Report 1972

	Upstream	Downstream
DOMESTIC WATER SUPPLY	Municipal water obtained from Welland Ship Canal	
INDUSTRIAL WATER SUPPLY		Industrial water from Welland Ship Canal (which is now Old Welland Canal, I think) (comb. 31 mgd) for Beaver Wood Fibre, Ontario Paper (other industries use water ~~but to a much lesser degree Domtar~~
RECREATION Swimming Boating Fishing Game/Forage		- swimming banned along shore on either side of Port Dalhousie (whe (where Martindale Pond empties into Lake Ontario) because water quality is so poor.
COMMERCIAL FISHING		
HYDRO POWER		Decew Falls - Sir Adam Beck - Niagara River
WASTE DISPOSAL Municipal Industrial Other	Construction of secondary treatment facilities (for municipal wastes under way at St. Catherines, Thorold & Welland	Sanitary sewage from Thorold south pumped to Welland Canal
OTHER RECREATIONAL WATER AVAILABLE		
COMMENTS		
OTHER		

Mill(s):

LOCATION: - Lake Gibson

	Upstream	Downstream
DOMESTIC WATER SUPPLY		
INDUSTRIAL WATER SUPPLY		
RECREATION Swimming Boating Fishing Game/Forage		
COMMERCIAL FISHING		
HYDRO POWER	- is holding lake for water before DeCew power plant	
WASTE DISPOSAL Municipal Industrial Other		
OTHER RECREATIONAL WATER AVAILABLE		
COMMENTS	receives the waters of Beaver Dam Creek & also diverted water from Welland Ship Canal	
OTHER		

Mill(s):

LOCATION: - BEAVER DAM CREEK

	Upstream	Downstream
DOMESTIC WATER SUPPLY		
INDUSTRIAL WATER SUPPLY		
RECREATION Swimming Boating Fishing Game/Forage		
COMMERCIAL FISHING		
HYDRO POWER		
WASTE DISPOSAL Municipal Industrial Other	3 companies discharge industrial wastes (NACR p.17) Beaverwood fibre 3.6 mgd) & Hayes Dana (0.35 mgd)	
OTHER RECREATIONAL WATER AVAILABLE		
COMMENTS		
OTHER		

Mill(s): Canadian International Paper Co. LOCATION: - Ottawa River Basin - Ottawa River (Towns: Hawkesbury & Ottawa) (Study 1971/2) Basin

	Upstream	Downstream
DOMESTIC WATER SUPPLY		see attached photocopies on water use conflicts
INDUSTRIAL WATER SUPPLY		
RECREATION Swimming Boating Fishing Game/Forage	- recreation (swimming, boating & fishing to a lesser extent impossible in certain areas of river because of pollution (ie downstream from Ottawa & Hull)	
COMMERCIAL FISHING		Commercial fishing banned downstream from Chaudiere Dam b/c of mercury contamination
HYDRO POWER		
WASTE DISPOSAL Municipal Industrial Other		See attached copies for degree of usage for discharge of wastes into river
OTHER RECREATIONAL WATER AVAILABLE		
COMMENTS		
OTHER	- at some locations along river property values have decreased primarily because of water quality impairment	NOTE: Because of the number of p & p mills along the river it would be very time consuming to take each one, then classify as upstream or downstream so I have done the river as a whole

Mill(s): American Can of Canada Ltd

LOCATION: - Peninsula Harbour (Lake Superior)
(Town: Marathon)

	Upstream	Downstream
DOMESTIC WATER SUPPLY	- water supply for the township of Marathon is from wells (pop. 2500)	
INDUSTRIAL WATER SUPPLY	for American Can 25 mgd sections of harbour also used for storage of logs	
RECREATION Swimming Boating Fishing Game/Forage		
COMMERCIAL FISHING		no extensive commercial fishing in the harbour in the vicinity of Marathon - fish analysed in that vicinity are contaminated ~~above levels safe for human~~ consumption.
HYDRO POWER		
WASTE DISPOSAL Municipal Industrial Other	Sewage primary (treated) discharged into Lake Superior - not Peninsular Harbour (.30 mgd)	2nd between 80-90% of waste water from mill and chlor-alkali plant discharged to Lake Superior - not Pen. Harbour - the rest discharged to Pen Harbour
OTHER RECREATIONAL WATER AVAILABLE	Yes	Yes
COMMENTS	The bay is large.	
OTHER		

Mill(s):

LOCATION: - St. Lawrence River (see over
(Town: Cornwall) Study donw 1966/7

	Upstream	Downstream
DOMESTIC WATER SUPPLY		Yes for Cornwall
INDUSTRIAL WATER SUPPLY		Yes for Cornwall
RECREATION Swimming Boating Fishing Game/Forage		
COMMERCIAL FISHING		
HYDRO POWER	Upstream Moses Saunders Power Dam	
WASTE DISPOSAL Municipal Industrial Other		-both domestic & industrial waste discharged into St. Lawrence from Cornwall - major ind. Domtar 42.9 Courtalds (produces vicose rayon carpet film) 12.8 mgd.
OTHER RECREATIONAL WATER AVAILABLE		
COMMENTS		
OTHER	Commercial navigation is obviously an important use.	

This study was done on the St. Lawrence from roughly Kingston (furthest upstream) to the Quebec border. Cornwall is the last town of major size on the study downstream from all the others. Many of the towns along the river discharge their municipal & industrial wastes into the river. (Further information can be obtained on each town if desired, but most of it is pertinent only on each town if desired, but most of it is pertinent only to water quality and biological evaluation of fauna & flora and does not mention the resulting conflicting water uses)

St. Lawrence River carries discharge of waters from the entire Great Lakes System

Commercial fisheries, hydro, recreation, waste assimilation, domestic & industrial water supply, commercial shipping. area all uses - specific information in terms of local areas would require a great deal of research.

Mill(s): Abitibi Power & Paper Co LOCATION: - St. Mary's River (Town: Sault Ste. Marie) Study 1967

	Upstream	Downstream
DOMESTIC WATER SUPPLY	for city of Sault Ste Marie	
INDUSTRIAL WATER SUPPLY	Yes	
RECREATION Swimming Boating Fishing Game/Forage	Some - not clear yet how much - game fish populations declining	
COMMERCIAL FISHING	??	
HYDRO POWER	Yes - St. Mary's Falls	
WASTE DISPOSAL Municipal Industrial Other		Treated sewage from Sault Ste Marie (1) Algoma Steel - more than half working (major pollutant) force of the city (2) Abitibi (3 &4) Mannesman Tube, Domtar (Chem.)
OTHER RECREATIONAL WATER AVAILABLE	Yes	Yes
COMMENTS	this river is connecting waterway between Lake (flow from Superior to Huron) Huron & Lake Superior - it is an international water dividing Canada & the US (Michigan)	
OTHER	Commercial navigation - upstream & down	

Mill(s): Abitibi Power & Paper Co.

LOCATION: - Sturgeon River Study 1965
(Town: Sturgeon River)

	Upstream	Downstream
DOMESTIC WATER SUPPLY	For Sturgeon Falls (pop. 7,000 - 1965) from Sturgeon River 539,000 g/day	
INDUSTRIAL WATER SUPPLY		- water considered unfit for swimming at town's beach Because of good game fishing very active tourist trade during summer months
RECREATION Swimming Boating Fishing Game/Forage		
COMMERCIAL FISHING		
HYDRO POWER		
WASTE DISPOSAL Municipal Industrial Other	Untreated sanitary wastes from Sturgeon Falls (1965 - talk of sewage treatment plant & company talk of treatment of industrial wastes)	Abitibi - process wastes & sanitary wastes discharged untreated into river 10 mgd
OTHER RECREATIONAL WATER AVAILABLE	Yes	Yes
COMMENTS		
OTHER	Tourist trade second (after Abitibi) as source of Revenue (1965) Tourist establishments & cottage owners downstream complain about tiver - they report decrease in their business	

Mill(s): LOCATION: - Thunder Bay Kam River

	Upstream	Downstream
DOMESTIC WATER SUPPLY	2 plants (1) North plant = water from Thunder Bay at Base point - outer harbour (2) Lock Lamond	- outlying municipalities water supply from wells
INDUSTRIAL WATER SUPPLY	- used to be used for long driving - no longer	- harbour - important for commercial shipping - ships can navigate up Kam R. part way
RECREATION Swimming Boating Fishing Game/Forage		- poor water quality aesthetically displeasing limite use of Kam R. for boating & swimming - - excellent potential for recreational development - no public swimming on lower Kam R.
COMMERCIAL FISHING		- in past good commercial fishing but changing fish populations no m more comm. fishing in T. Bay - now limited to open waters of Lake Superior
HYDRO POWER		
WASTE DISPOSAL Municipal Industrial Other	(Great Lakes supposed to be installing comprehensive pollution controls by 1974) - pulp & paper largest industrial polluter	
OTHER RECREATIONAL WATER AVAILABLE		
COMMENTS	- sub-division development rejected by OMB because of inadequate sewage collection & treatment systems.	
OTHER		

Mill(s): 1-3 Abitibi (3 mills)
4 Great Lakes Paper

LOCATION: - Kaministikwia River 1972 Study
Thunder Bay Harbour

	Upstream	Downstream
DOMESTIC WATER SUPPLY	T.B. - population 110,000	
INDUSTRIAL WATER SUPPLY	&processing - Great Lakes - 68 mgd fromKam	largest individual Ind. user OH Thermal GS takes 72-78MGD cooling water from mouth of Mission River P&P Ind. largest user Abi. all 3 on inner harbour 39 mgd for cooling R. add. water taken from Mun. syste
RECREATION Swimming Boating Fishing Game/Forage		- small craft in harbour restricted by commercial shipping - no signifant fishing due to low fish population b/c of poor water quality.
COMMERCIAL FISHING		seriously declined over past decades - fish tainting found 40 years ago - restrict lake trout - see next page
HYDRO POWER	Mission River-Ontario Hydro Thermal GS	Dams feeding lakes (1) Silver Falls GS - 10 mi. upstream from community (Kaministikwia) (2) Kakbeka Falls Dam &GS (3) mouth of
WASTE DISPOSAL Municipal Industrial Other	upstream/downstream unclear - both treated & untreated wastes Municipal (1) plant into McIntyre R. (2) plant into KaminR.	see comments next page - also a considerable source of poll'n ind. discharges largest source of poll. (ie. account for 90% of BOD_5).
OTHER RECREATIONAL WATER AVAILABLE	- most definite Yes - close proximity many inland lakes & rivers which are unspoiled by pollution	- downstream is Lake Superior outer harbour - still useful for recreation
COMMENTS	- within city of T.B. watersheds are flat - some areas of city are therefore flooded during periods of high run-offs	
OTHER	2 miles upstream from its mouth river divides into 3 - Kaministikwia, Mckellar & Mission Rivers - Mission dredged for shipping - shipping use discontinued in McKellar	

Mill(s): Domtar Packaging (see comments) LOCATION: - Trent River (part of Trent Waterway) (Town: Trenton) 1963 Study

	Upstream	Downstream
DOMESTIC WATER SUPPLY		for Trenton is obtained from the Trent River
INDUSTRIAL WATER SUPPLY	Many industries use the Trent waterway for industrial water supply. All the way upstream including Glen Miller	
RECREATION Swimming Boating Fishing Game/Forage	Extensive recreational use Specifically Rice Lake & Kawartha Lake chain.	
COMMERCIAL FISHING	probably not	
HYDRO POWER	Many municipalities use the Trent system for the discharge of municipal & industrial wastes	Trent R. receives discharges from the storm sewer system & from the sewage treatment plant which has its outfall near the mouth.
WASTE DISPOSAL Municipal Industrial Other		
OTHER RECREATIONAL WATER AVAILABLE		
COMMENTS	Almost all municipalities upstream use the system as a water supply source	At time of the study no mention is made of Domtar at Trenton
OTHER	The Trent waterway of which the Trent R. is a part is a sewies of rivers, lakes , locks & dams 2 marine railways which provide navigation from L. Ont. to Geor. Bay - covers many miles	Trenton is at the very end of the system where the Trent R. empties into Bay of Quinte & then St. Lawrence R.

Mill(s): Dryden Paper Company LOCATION: - Wabigoon River 1969 Study

	Upstream	Downstream
DOMESTIC WATER SUPPLY	Probably from river, no info as yet	
INDUSTRIAL WATER SUPPLY		used for translocation & assimilation of wastes
RECREATION Swimming Boating Fishing Game/Forage		- extremely doubtful Pollution of Wabigoon is major cause for concern of Tourist industry in N.W. Ontario
COMMERCIAL FISHING		Clay Lake 53 mi downstream catch: 1953 - 6,436 lb. 1960 - 437 lb 1968 - no fishing
HYDRO POWER		= generation of power at Dryden & Eagle Rivers, limited use in comparison with industrial waste disposal
WASTE DISPOSAL Municipal Industrial Other	Dryden's pop. - 6,800	Major waste load is from Dryden Paper co. (daily 30 mill. gal wast waste water) Domestic Wastes - discharged after primary & secondary treatment
OTHER RECREATIONAL WATER AVAILABLE	Yes	
COMMENTS	Should I order 1968 study ib tourism in N. W. Ontario	Peter & Jack - Tourism is 3rd largest industry in N.W. Ontario (forestry & mining first) in terms of $$ earnings see graph
OTHER	Descriptive quote Page 21, on stateof Pollution.	

Mill(s): Ontario Minnesota Pulp & Paper

LOCATION: - Winnipeg River & Rat Portage Bay (Town of Kenora) 1967Study

	Upstream	Downstream
DOMESTIC WATER SUPPLY	Kenora - 11,000 pop. from Rat Portage Bay upstream 2 mgd	Probably few cottages & Dalles Indian Reserve (very approximately 4 miles d/s)
INDUSTRIAL WATER SUPPLY	OMP&P - from eastern outlet of Rat Portage Bay 23 mgd	
RECREATION Swimming Boating Fishing Game/Forage	Highly developed recreational resource - NB: Tourist industry in Rat Portage Bay & Lake of the Woods	Winnipeg River - much less well used recreationally than Rat Portage Bay. - very little swimming, boating, some sport fish
COMMERCIAL FISHING	Unless effluent discharge is kept within a certain range these fish populations may no longer support their present use	Winnipeg River both commercial (samll scale) & subsistence fishing - by some members of Dalles Indian Reserve
HYDRO POWER	4 generating stations 2 upstream	2 downstream
WASTE DISPOSAL Municipal Industrial Other	Some sanitary wastes from Keewating (pop. 2,000) - seepage from cottages watercraft	Kenora (pop. 11,000) - sanitary wastes to be treated before disposal. - some OMPP - bulk of industrial wastes - 20mg/day discharged to Winnipeg River.
OTHER RECREATIONAL WATER AVAILABLE	Yes	
COMMENTS		- other industry will not be attracted to locate downstream from mill as if they needed water for processing it would not be of high enough quality.
OTHER		It is hypothesized that limited co cottage development & Other on W.R. recreational uses occur seldom due to the poor water quality & unpleasing aesthetics downstream from mill, since Rat Portage Bay is so extensively used for these purposes.

Mill(s):

LOCATION: - 12 Mile Creek

	Upstream	Downstream
DOMESTIC WATER SUPPLY		
INDUSTRIAL WATER SUPPLY		
RECREATION Swimming Boating Fishing Game/Forage	Perhaps recreation is possible upstream from confluence with Old Welland Canal	
COMMERCIAL FISHING		No - impossible downstream
HYDRO POWER		Decew Falls (2 power plants) flumes discharge at T6.87 & T6.98
WASTE DISPOSAL Municipal Industrial Other	4 companies discharge their industrial wastes at St. Catherines 1 at Thorold 1 at Pelham (NCAR-18)	
OTHER RECREATIONAL WATER AVAILABLE	Heavy population, highly developed transportation system - much of shoreline of lakes in private hands - increasingly heavy urban development, all this puts more & more pressure to maintain water quality from what I can see, other recreational water is limited	
COMMENTS		In spite of high flow, after power plant the quality of 12 Mile Creek is less than desirable
OTHER	This is an agricultural area & pollution from this source (mainly farm animal wastes chemical fertilizer & pesticides often find their way to the streams & canals we are concerned with here (NACR .26)	

Mill(s):

LOCATION: - Lake Ontario NCAR (Niagara Region)

	Upstream	Downstream
DOMESTIC WATER SUPPLY		
INDUSTRIAL WATER SUPPLY		
RECREATION Swimming Boating Fishing Game/Forage		
COMMERCIAL FISHING		
HYDRO POWER		
WASTE DISPOSAL Municipal Industrial Other	3 discharge at Grimsby 2 at Lincoln 1 Niagara on the Lake 1 Pelham	NCAR lists municipal wastes from Thorold, St. Catherines, & 8 other urban areas as being discharged into Lake Ontario
OTHER RECREATIONAL WATER AVAILABLE		
COMMENTS		
OTHER		

Mill(s):

LOCATION: Welland Ship Canal (new)

	Upstream	Downstream
DOMESTIC WATER SUPPLY		Supplies water for domestic use to tonship of Thorold south (1964)
INDUSTRIAL WATER SUPPLY	1964 lists 4 industries as using Welland Ship Canal for water supply. (including Beaver Wood Fibre 5mgd) & Ontario Paper Co Ltd (26.3mgd) this conflicts with other report (NCAR) that Beaver Wood Fibre gets water supply from Beaver Dan Creek.	
RECREATION Swimming Boating Fishing Game/Forage	Extensive use - Very doubtful due to navigation - Perhaps some boating	
COMMERCIAL FISHING	No	
HYDRO POWER		
WASTE DISPOSAL Municipal Industrial Other		5 companies discharge industrial wastes there. (none are p&p) (NACR p.22)
OTHER RECREATIONAL WATER AVAILABLE		
COMMENTS		
OTHER		

Mill(s): Domtar

LOCATION: - Nipigon Bay (Town: Red Rock)
1966/7 Study

	Upstream	Downstream
DOMESTIC WATER SUPPLY	Town of Nipigon - taken from Nipigon River	Townsite of Red Rock - taken from Nipigon Bay
INDUSTRIAL WATER SUPPLY		Domtar Newsprint (uses excess of 20 mgd) is main consumer of water from Bay
RECREATION Swimming Boating Fishing Game/Forage		- potential for recreation so far not developed - predicted possibilities (1) increase in tourism (2) local inhabitants as area becomes more prosperous
COMMERCIAL FISHING		- in past commercial fishing was profitable (10 yrs ago) but no longer due to decreases in fish pop. & poorer quality of fish: see note on Pages 4&5.
HYDRO POWER	Pine Portage - Hydro G.S. on Nipigon River	
WASTE DISPOSAL Municipal Industrial Other	From Nipigon (2,700 pop) dishcharged to Nipigon River after primary treatment	Red Rock - sanitary wastes discharged without treatment to Nipigon Bay Domtar - major source of pollutant entering the Bay
OTHER RECREATIONAL WATER AVAILABLE	Yes	Yes
COMMENTS		
OTHER	Insecticide DDT additional contaminant to Bay (1945-1966 used to control black fly larvae)	

Mill(s): E. B. Eddy Co

LOCATION: - Ottawa River Basin (Ottawa River Basin Study 1971/2 (Ottawa & Hawkesbury)

	Upstream Covers 200 - 250 miles	Downstream
DOMESTIC WATER SUPPLY	- provides domestic water supply - can't specify where from report 56 mgd to 15 municipalities	
INDUSTRIAL WATER SUPPLY	- provides industrial water supply both upstream & downstream log driving	200 mgd from Ottawa River 103 mgd from its tributaries
RECREATION Swimming Boating Fishing Game/Forage	-supports wide variety of water based recreational activities -upstream (Temiscaming up) not highly developed b/c of low pop. denisty - sport fishing extensive	River is ideally suited to recreational use - concentration of pop along the river, good transportation system tourism brought partly b/c area contains National Capital *see comments
COMMERCIAL FISHING	Some Commercial fishing but not in Hydro power production within St. Lawrence River & Great Lakes drainage basin	
HYDRO POWER	Several dams and G.S. (7) - ranks fourth in hydro power production within St. Lawrence & Great Lakes drainage basin	
WASTE DISPOSAL Municipal Industrial Other	Both municipal & Industrial wastes are discharged into the river from municipalities both up and downstream	- heavy discharge from p&p which exerts heaviest pollution pressure
OTHER RECREATIONAL WATER AVAILABLE	Yes - but often at some distance for urban residents	Recreation - water quality in several areas has been degraded beyoun
COMMENTS		Recreation - water quality in several areas has been degraded beyond the point where it can be used for recreation & to support fish & wildlife - with growth of
OTHER	Navigation of river primarily confined to recreational boating & log driving	pop improvement of trans. these areas need to be restored to fulfill their recreational potent. The Ottawa River Study is very extensive & probably provides some of the most useful information of any of the studies

Pulp & Paper Mills in Ottawa River Basin

Canadian International Paper
- located at Kipawa, Gatineau, Hawkesbury

E. B. Eddy located at Hull

Thurso Pulp & Paper location - Thurso

APPENDIX G

"Analysis of Waste Treatment Alternatives:
Eddy Forest Products Ltd., Espanola and Atitibi Paper Co. Ltd.,
Iroquois Falls"

by Philip Wormwell and Peter Victor

Supplement by Peter Victor

ANALYSIS OF WASTE TREATMENT ALTERNATIVES:

EDDY FOREST PRODUCTS LTD., ESPANOLA

AND

ABITIBI PAPER CO. LTD., IROQUOIS FALLS

Management Consulting Services Division
Ministry of Government Services
Project No. 456
April 11, 1974.

LIST OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

1. INTRODUCTION

In 1973, the Strategic Planning Branch, Ministry of the Environment, began a study of the effects of alternative pollution abatement policies on the Ontario pulp and paper industry.[1] As part of this study, we developed a procedure whereby the alternatives for waste treatment and reduction in a mill could be identified and their costs and resulting wastes could be calculated. This report illustrates the procedure by describing its application to two existing mills.

The information needed for the procedure to be carried out is summarized in Section 2. Section 3 explains how the expressions used to calculate the present values of the costs of the alternatives are derived. Sections 4 and 5 state the particular information used in the analysis of the two mills and list the results. The applicability of the approach to more general and larger problems is discussed in Section 6.

---

1. "Analysis of Pollution Abatement Alternatives for the Pulp and Paper Industry in Ontario", Strategic Planning Branch, Ministry of the Environment, Spring, 1974.

2. INFORMATION NEEDED FOR THE ANALYSIS

The first part of the procedure is to identify the waste treatment alternatives. This requires the following information:

- a diagram showing the existing waste flows and sewer system at the mill;
- the possible types of waste treatment (or reduction) at the mill, including their points of application to the existing waste flows;[1]
- the restrictions on the possible combinations of these types of waste treatment.

Next, the BOD and flow rate at the river resulting from each waste treatment alternative are calculated.[2] For this calculation, the following information is needed:

- the existing BOD and flow rate of each waste flow;
- the percent reductions in BOD and flow rate achieved by each possible type of waste treatment, including any existing treatment.

The present value of the costs of each alternative is calculated last.[3] This calculation needs the following information:

- the capital cost of each type of waste treatment;
- the annual operating and maintenance costs of each type of waste treatment;

---

1. In this report, changes in the level of production or in the product mix are not included in the types of waste reduction analyzed. For a discussion of how these waste reduction methods might be included, see Section 6.
2. Other parameters, such as suspended solids, can be calculated in a similar way. Section 6 discusses such extensions to other parameters.
3. This is defined to be the present value of the difference between the costs of the mill including the additional treatment during the economic life of the treatment equipment and the costs of the mill excluding the additional treatment during the same period, assuming the gross revenues of the mill with and without the additional treatment are the same. For more detail, see Section 3.

- the interest rate on the capital loan;
- the discount rate;
- the profits tax rate;
- the economic life of the waste treatment equipment;
- the allowable tax deductions.

3. EXPRESSIONS FOR THE PRESENT VALUES

3.1 Definitions

The following parameters are assumed to be the same for each waste treatment alternative:

i = interest rate (% per annum/100)

d = discount rate (% per annum/100)

r = profits tax rate (% per annum/100)

n = economic life of the waste treatment equipment (years).

The following variables depend on the particular waste treatment alternative:

M = total annual operating and maintenance cost of the alternative, assumed to be the same in each of the n years ($m)

C = total capital cost of the alternative, assuming all equipment is purchased in the first year ($m).

3.2 Debt Repayment

The annual debt repayment ($m) for a given alternative is zC at the end of each year, where

$$z = i(1+i)^n/((1+i)^n-1).$$

The interest portion of the repayment is w_jC at the end of year j for j = 1 to n, where

$$w_j = i((1+i)^n - (1+i)^{j-1})/((1+i)^n-1).$$

3.3 Tax Situations

The present value of the costs of each waste treatment alternative is calculated for each of the following three tax situations:

Case 1: The existing taxable income is greater than zero and sufficiently large in each of the n years that the following tax deductions associated with the treatment are allowed:

- the total annual operating and maintenance costs, M, in each of the n years;[1]
- the interest payment, $w_j C$, in year j for j = 1 to n;
- a depreciation allowance, C/2, in years 1 and 2 only.

Case 2: There is no existing taxable income in each of the n years and there remains no taxable income after purchase of the treatment even if there are resulting savings in total annual operating and maintenance costs.

Case 3: The existing taxable income is greater than zero and sufficiently large in each of the n years that the following tax deductions associated with the treatment are allowed:

- the total annual operating and maintenance costs, M, in each of the n years;
- the interest payment, $w_j C$, in year j for j = 1 to n;
- a depreciation allowance, C/n, in each of the n years.

---

1. If there are savings in total annual operating and maintenance costs as a result of the treatment, M is negative. Thus, the savings are an addition to (rather than a deduction from) taxable income.

3.4 Tax Avoided

The profits tax avoided as a result of the waste treatment is:

Case 1: tax avoided[1] ($m) $= \begin{cases} r(M+w_jC + C/2) & \text{in year } j \text{ for } j = 1 \text{ to } 2 \\ r(M+w_jC) & \text{in year } j \text{ for } j = 3 \text{ to } n; \end{cases}$

Case 2: tax avoided ($m) = 0 in year j for j = 1 to n;

Case 3: tax avoided[1] ($m) = $r(M+w_jC + C/n)$ in year j for j = 1 to n.

3.5 Present Value

It follows that the present value of the costs associated with a given waste treatment alternative is:

Case 1: present value ($m) $= \sum_{j=1}^{2} (M+zC-r(M+w_jC + C/2))/(1+d)^j$

$+ \sum_{j=3}^{n} (M+zC-r(M+w_jC))/(1+d)^j$

Case 2: present value ($m) $= \sum_{j=1}^{n} (M+zC)/(1+d)^j$

Case 3: present value ($m) $= \sum_{j=1}^{n} (M+zC-r(M+w_jC + C/n))/(1+d)^j$

3.6 Assumed Values of the Parameters

In the analysis described in Sections 4 and 5, the following values are assumed:

$i = 0.15$
$d = 0.15$
$r = 0.49$
$n = 25.$

---

1. If M is negative and sufficiently large in magnitude, this "tax avoided" is negative (i.e. extra profits tax is incurred as a result of the treatment.)

4. EDDY FOREST PRODUCTS LTD., ESPANOLA

4.1 The Existing Mill[1]

Figure 1 is a diagram of the sewer system of the existing mill and shows the assumed BOD and flow rates prior to additional treatment.

4.2 The Waste Treatment Alternatives

The types of treatment or waste reduction methods considered are:

- dry barking (affecting waste flow 1[2]);
- condensate stripping (affecting waste flow 3);
- flow reduction (affecting waste flows 3, 4, 7 and 8);
- oxygen bleaching (affecting waste flows 4 and 7);
- biological treatment (aerated lagoon or activated sludge) of the following possible combinations of waste flows:
  - 1 only
  - 2 only
  - 4 only
  - 5 only
  - 6 only
  - 7 only
  - 1 and 2
  - 1 and 6
  - 1 and 7
  - 2 and 6
  - 2 and 7
  - 2, 6 and 7
  - 1, 6 and 7
  - 1, 2 and 7
  - 1, 2 and 6
  - 1, 2, 6 and 7.

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1. Based on the description in Reference 1.
2. See Figure 1.

THE EXISTING MILL - EDDY FOREST PRODUCTS LTD., ESPANOLA

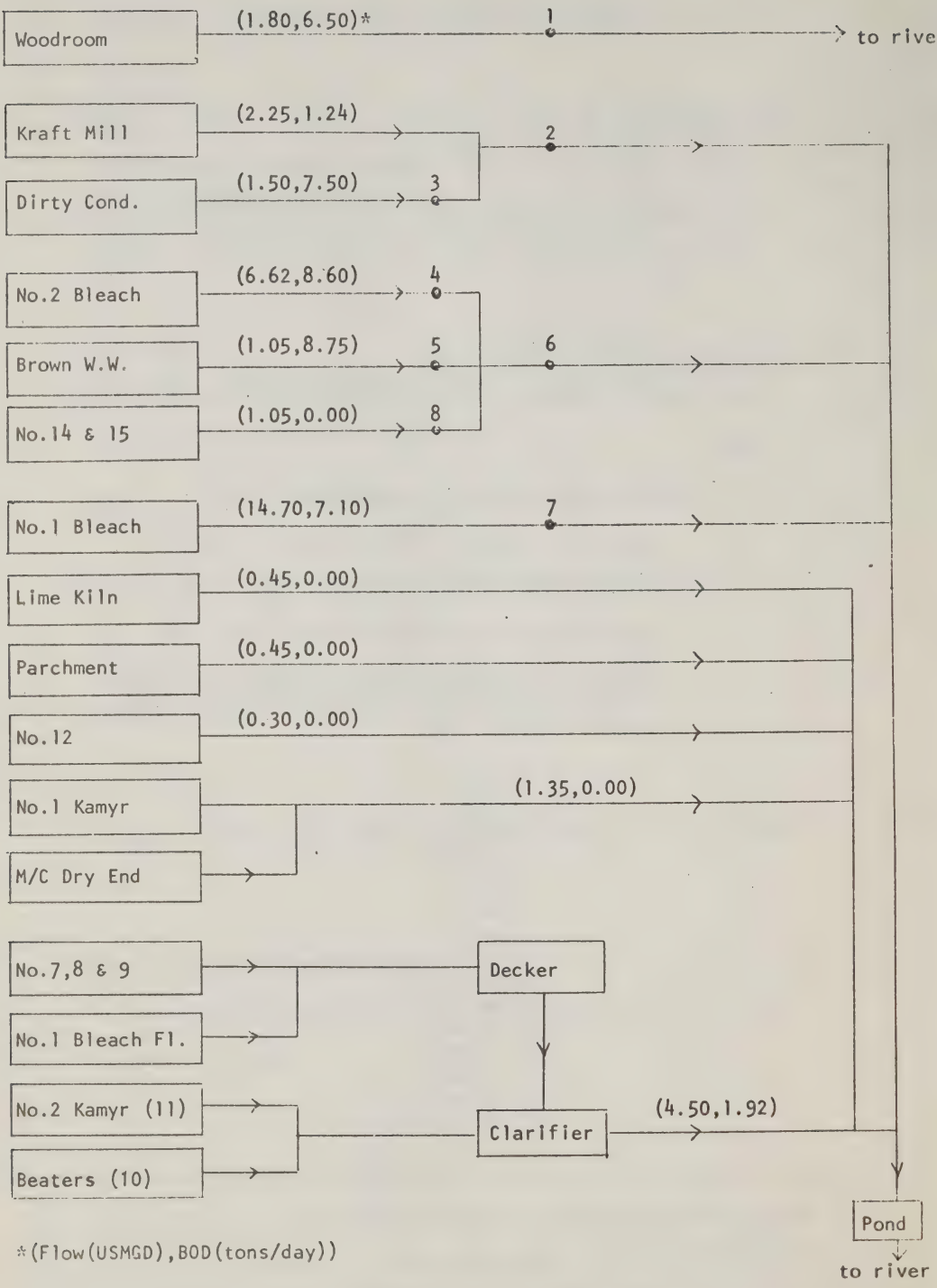


FIGURE 1

The complete set of alternatives analysed is derived as follows:

dry barking or no dry barking

plus condensate stripping or no condensate stripping

plus flow reduction or no flow reduction

plus oxygen bleaching or no oxygen bleaching

plus activated sludge treatment of one of the combinations of waste flows noted above or no activated sludge treatment

plus aerated lagoon treatment of one of the combinations of waste flows noted above or no aerated lagoon treatment

with the following exclusions:[1]

- if dry barking, not biological treatment of waste flow 1;
- not both activated sludge and aerated lagoon treatments;
- if condensate stripping, not biological treatment of waste flow 2;
- if oxygen bleaching, not biological treatment of waste flow 4 and not biological treatment of waste flow 7;
- if biological treatment of waste flow 4, not biological treatment of any other waste flow;
- if biological treatment of waste flow 5, not biological treatment of any other waste flow;
- if not flow reduction, not condensate stripping;

---

1. Since we could not analyze all the possible combinations of treatment in the time available for the study, we excluded combinations which appeared unattractive in terms of cost and treatment efficiency relative to combinations which were included.

but including the following two alternatives:

- condensate stripping plus flow reduction plus oxygen bleaching plus activated sludge treatment of waste flows 1, 2, 6 and 7;
- condensate stripping plus flow reduction plus oxygen bleaching plus aerated lagoon treatment of waste flows 1, 2, 6 and 7.

4.3 The Treatment Efficiencies

This Section states the assumed percent reductions in BOD and flow rates achieved by the possible treatments.[1]

	BOD	Flow Rate
Dry Barking		
Waste flow 1:	100%	100%
Condensate Stripping		
Waste flow 3:	40%	0%
Flow Reduction		
Waste flow 3:	80%	80%
Waste flow 4:	0%	40%
Waste flow 7:	0%	70%
Waste flow 8:	0%	40%
Oxygen Bleaching		
Waste flow 4:	58%	40%
Waste flow 7:	58%	40%
Activated Sludge		
Waste flow 1:	90%	0%
Waste flow 2:	90%	0%
Waste flow 4:	90%	0%
Waste flow 5:	90%	0%
Waste flow 6:	78% if oxygen bleaching 90% otherwise	0%
Waste flow 7:	90%	0%
Aerated Lagoon		
Waste flow 1:	80%	0%
Waste flow 2:	80%	0%
Waste flow 4:	80%	0%
Waste flow 5:	80%	0%
Waste flow 6:	68% if oxygen bleaching 80% otherwise	0%
Waste flow 7:	80%	0%

1. The values for condensate stripping, flow reduction, oxygen bleaching and biological treatment of waste flow 6 with oxygen bleaching are roughly equivalent to the reductions assumed in Reference 1, expressed as percentages. The other values were based on a literature survey by P.A. Victor, Strategic Planning Branch and were confirmed by E.W. Turner, Industrial Wastes Branch, Ministry of the Environment. See references 2,3,6,7 and 8.

Additional assumptions on which the calculations of BOD and flow rates at the river are based are as follows:

- all waste flows are treated by the pond except that waste flow 1 is treated by the pond only if there is biological treatment of waste flow 1 and at least one other waste flow;

- the pond removes 18% of the BOD from that portion of the waste flow through it which is not biologically treated and 0% from that which is biologically treated.

4.4 The Capital Costs and the Annual Operating and Maintenance Costs

This Section states the capital and annual operating and maintenance costs assumed in the calculation of present values.

	Capital Cost ($m)	Annual Operating and Maintenance Costs ($m)
Dry Barking[1]	1.00	0.00
Condensate Stripping[1]	0.80	0.08
Flow Reduction[2]	0.00	0.00
Oxygen Bleaching[3]	4.75	-1.34

A graph of the capital cost of activated sludge treatment for varying design capacities is shown in Figure 2.[4] The design capacity is assumed to be 25% greater than the actual flow treated.[2] The following additional assumptions are made:

- the aerated lagoon capital cost is 80% of the activated sludge capital cost for the same design capacity;[5]
- the annual operating and maintenance costs of aerated lagoon treatment and of activated sludge treatment are 16.5% of the respective capital cost.[6]

---

1. Values specified by E.W. Turner, Industrial Wastes Branch, Ministry of the Environment.
2. Values specified by P.A. Victor, Strategic Planning Branch, Ministry of the Environment.
3. See Reference 1.
4. Based on data from Reference 3 and the capital cost of activated sludge treatment corresponding to "bleaching with flow reduction" in Reference 1.
5. Based on the relative capital costs of the activated sludge and aerated lagoon treatments corresponding to "bleaching with flow reduction" in Reference 1.
6. See Reference 2.

GRAPH OF ACTIVATED SLUDGE CAPITAL COST

EDDY FOREST PRODUCTS LTD., ESPANOLA

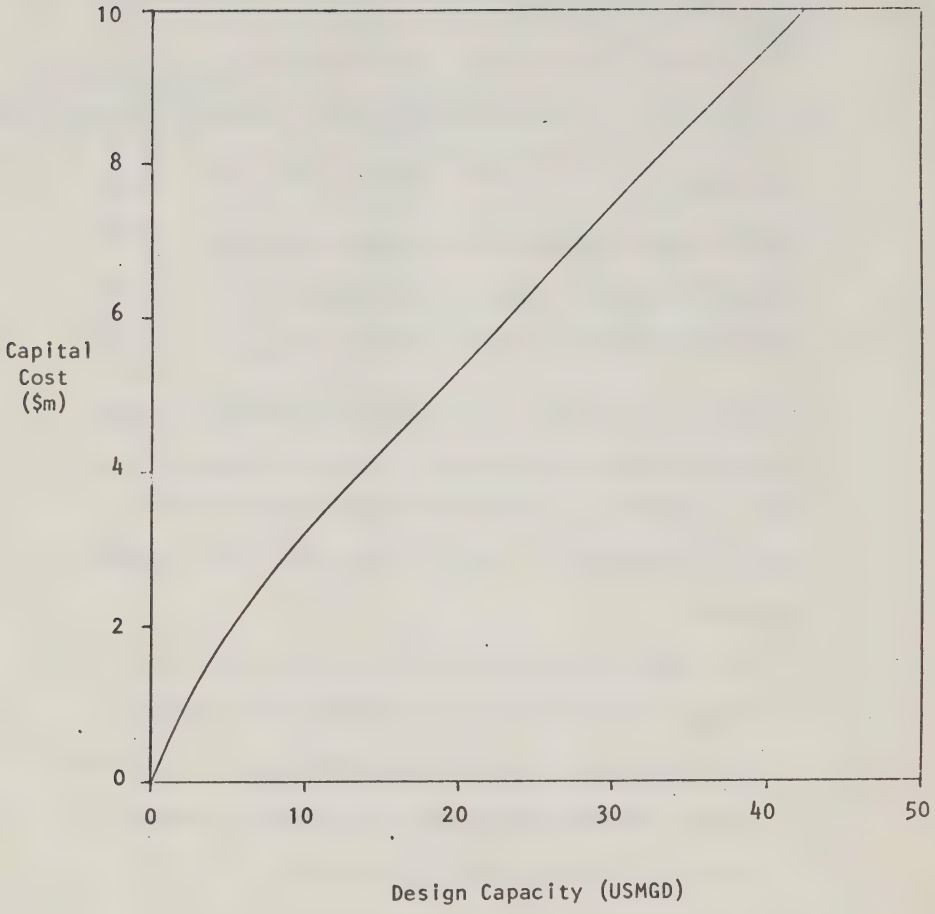


FIGURE 2

4.5 Results of the Calculations

For a given waste treatment alternative, the BOD and flow-rates at the river and the present value for each of the three tax situations are calculated using the expressions in Section 3.5 and the assumptions in Sections 4.3 and 4.4. The results of these calculations are listed below, using the following notation and grouping the alternatives according to which waste flows are biologically treated:

DB = dry barking
CS = condensate stripping
FR = flow reduction

OB = oxygen bleaching
Bio = biological treatment

AS = activated sludge
AL = aerated lagoon

Alternative number	Description	BOD (tons/day)	Flow (USMGD)	Present Value ($m) Case 2	Case 3	Case 1
No Bio						
1	CS + FR	29.87	21.46	1.32	0.61	0.39
2	CS + FR + DB	23.37	19.66	2.32	1.04	0.55
3	CS + FR + OB	22.41	18.11	-2.59	-1.75	-3.26
4	CS + FR + DB + OB	15.91	16.31	-1.59	-1.32	-3.09
5	no other treatment	35.29	36.02	0	0	0
6	DB	28.79	34.22	1.00	0.43	0.16
7	OB	27.83	27.49	-3.91	-2.36	-3.65
8	DB + OB	21.33	25.69	-2.91	-1.93	-3.49
9	FR	30.37	21.46	0	0	0
10	FR + DB	23.87	19.66	1.00	0.43	0.16
11	FR + OB	22.91	18.11	-3.91	-1.50	-3.65
12	FR + DB + OB	16.41	16.31	-2.91	-1.06	-3.49
Bio of 1 only						
13	CS + FR + AS	24.02	21.46	3.41	1.60	1.11
14	CS + FR + OB + AS	16.56	18.11	-0.56	-0.79	-2.57
15	CS + FR + AL	24.67	21.46	2.96	1.39	0.95
16	CS + FR + OB + AL	17.21	18.11	-0.95	-0.97	-2.70

/continued

Alternative number	Description	BOD (tons/day)	Flow (USMGD)	Present Value ($m) Case 2	Case 3	Case 1
	Bio of 1 only (contd)					
17	AS	29.44	36.02	2.10	0.99	0.72
18	OB + AS	21.98	27.49	-1.81	-1.37	-2.93
19	FR + AS	24.52	21.46	2.10	0.99	0.72
20	OB + FR + AS	17.06	18.11	-1.81	-1.37	-2.93
21	AL	30.09	36.02	1.64	0.77	0.55
22	OB + AL	22.63	27.49	-2.27	-1.58	-3.09
23	FR + AL	25.17	21.46	1.64	0.77	0.55
24	OB + FR + AL	17.71	18.11	-2.27	-1.58	-3.09
	Bio of 2 only					
25	AS	28.99	36.02	3.74	1.77	1.28
26	OB + AS	21.53	27.49	-0.17	-0.60	-2.37
27	DB + AS	22.49	34.22	4.74	2.20	1.44
28	FR + AS	28.39	21.46	2.88	1.37	0.99
29	OB + DB + AS	15.03	25.69	0.82	-0.16	-2.21
30	OB + FR + AS	20.93	18.11	-1.03	-0.99	-2.66
31	DB + FR + AS	21.89	19.66	3.87	1.80	1.15
32	OB + DB + FR + AS	14.43	16.31	-0.03	-0.56	-2.50
33	AL	29.87	36.02	2.99	1.42	1.02
34	OB + AL	22.41	27.49	-0.92	-0.94	-2.63
35	DB + AL	23.37	34.22	3.99	1.85	1.19
36	FR + AL	28.67	21.46	2.28	1.08	0.78
37	OB + DB + AL	15.91	25.69	0.08	-0.51	-2.46
38	OB + FR + AL	21.21	18.11	-1.63	-1.28	-2.87
39	DB + FR + AL	22.17	19.66	3.28	1.52	0.94
40	OB + DB + FR + AL	14.71	16.31	-0.63	-0.84	-2.71
	Bio of 4 only					
41	CS + FR + AS	23.68	21.46	5.22	2.46	1.72
42	CS + FR + DB + AS	17.18	19.66	6.22	2.89	1.88
43	CS + FR + AL	24.54	21.46	4.45	2.09	1.46
44	CS + FR + DB + AL	18.04	19.66	5.45	2.53	1.62
45	AS	29.10	36.02	5.66	2.68	1.93
46	DB + AS	22.60	34.22	6.66	3.11	2.09
47	FR + AS	24.18	21.46	3.90	1.85	1.33
48	DB + FR + AS	17.68	19.66	4.90	2.28	1.49
49	AL	29.96	36.02	4.53	2.14	1.54
50	DB + AL	23.46	34.22	5.53	2.57	1.70
51	FR + AL	25.04	21.46	3.14	1.49	1.07
52	DB + FR + AL	18.54	19.66	4.14	1.92	1.23
	Bio of 5 only					
53	CS + FR + AS	23.57	21.46	2.56	1.20	0.82
54	CS + FR + DB + AS	17.07	19.66	3.56	1.63	0.98
55	CS + FR + OB + AS	16.11	18.11	-1.35	-1.16	-2.83
56	CS + FR + DB + OB + AS	9.61	16.31	-0.35	-0.73	-2.67
57	CS + FR + AL	24.44	21.46	2.31	1.08	0.73
58	CS + FR + DB + AL	17.94	19.66	3.31	1.52	0.90

/continued

Alternative Number	Description	BOD (tons/day)	Flow (USMGD)	Present Value ($m) Case 2	Case 3	Case 1
	Bio of 5 only (contd)					
59	CS + FR + OB + AL	16.98	18.11	-1.60	-1.28	-2.91
60	CS + FR + DB + OB + AL	10.48	16.31	-0.60	-0.84	-2.75
61	AS	28.99	36.02	1.25	0.59	0.43
62	DB + AS	22.49	34.22	2.25	1.02	0.59
63	OB + AS	21.53	27.49	-2.67	-1.77	-3.22
64	FR + AS	24.07	21.46	1.25	0.59	0.43
65	DB + OB + AS	15.03	25.69	-1.67	-1.34	-3.06
66	DB + FR + AS	17.57	19.66	2.25	1.03	0.59
67	OB + FR + AS	16.61	18.11	-2.67	-1.77	-3.22
68	DB + OB + FR + AS	10.11	16.31	-1.67	-1.33	-3.06
69	AL	29.86	36.02	1.00	0.47	0.34
70	DB + AL	23.36	34.22	2.00	0.91	0.50
71	OB + AL	22.40	27.49	-2.41	-1.89	-3.31
72	FR + AL	24.94	21.46	1.00	0.47	0.34
73	DB + OB + AL	15.90	25.69	-1.91	-1.45	-3.15
74	DB + FR + AL	18.44	19.66	2.00	0.91	0.50
75	OB + FR + AL	17.48	18.11	-2.91	-1.88	-3.31
76	DB + OB + FR + AL	10.98	16.31	-1.91	-1.45	-3.14
	Bio of 6 only					
77	CS + FR + AS	17.38	21.46	6.46	3.05	2.15
78	CS + FR + DB + AS	10.88	19.66	7.46	3.48	2.31
79	CS + FR + OB + AS	13.51	18.11	1.42	0.16	-1.89
80	CS + FR + DB + OB + AS	7.01	16.31	2.42	0.59	-1.73
81	CS + FR + AL	19.11	21.46	5.45	2.56	1.81
82	CS + FR + DB + AL	12.61	19.66	6.45	2.99	1.97
83	CS + FR + OB + AL	14.74	18.11	0.64	- 0.22	-2.15
84	CS + FR + DB + OB + AL	8.24	16.31	1.64	0.21	-1.99
85	AS	22.80	36.02	6.91	3.26	2.36
86	DB + AS	16.30	34.22	7.91	3.70	2.52
87	OB + AS	12.43	27.49	1.47	0.19	-1.81
88	FR + AS	17.88	21.46	5.15	2.44	1.76
89	DB + OB + AS	12.43	25.69	2.47	0.62	-1.65
90	DB + FR + AS	11.38	19.66	6.15	2.87	1.92
91	OB + FR + AS	14.01	18.11	0.11	-0.46	-2.28
92	DB + OB + FR + AS	7.51	16.31	1.11	-0.02	-2.12
93	AL	24.53	36.02	5.52	2.61	1.88
94	DB + AL	18.03	34.22	6.52	3.05	2.05
95	OB + AL	20.16	27.49	0.37	-0.34	-2.19
96	FR + AL	19.61	21.46	4.13	1.96	1.41
97	DB + OB + AL	13.66	25.69	1.37	0.10	-2.03
98	DB + FR + AL	13.11	19.66	5.13	2.39	1.57
99	OB + FR + AL	15.24	18.11	-0.67	-0.82	-2.54
100	DB + OB + FR + AL	8.74	16.31	0.33	-0.39	-2.38

/ continued

Alternative Number	Description	BOD (tons/day)	Flow (USMGD)	Present Value ($m) Case 2	Case 3	Case 1
	Bio of 7 only					
101	CS + FR + AS	24.76	21.46	5.68	2.67	1.89
102	CS + FR + DB + AS	18.26	19.66	6.68	3.11	2.05
103	CS + FR + AL	25.47	21.46	4.81	2.26	1.59
104	CS + FR + DB + AL	18.97	19.66	5.81	2.69	1.75
105	AS	30.18	36.02	10.37	4.90	3.55
106	DB + AS	23.68	34.22	11.37	5.34	3.71
107	FR + AS	25.26	21.46	4.36	2.07	1.50
108	DB + FR + AS	18.76	19.66	5.36	2.50	1.66
109	AL	30.89	36.02	8.27	3.91	2.82
110	DB + AL	24.39	34.22	9.27	4.34	2.98
111	FR + AL	25.97	21.46	3.49	1.65	1.20
112	DB + FR + AL	19.47	19.66	4.49	2.09	1.36
	Bio of 1 and 2					
113	AS	23.14	36.02	5.15	2.44	1.76
114	OB + AS	15.68	27.49	1.24	0.08	-1.89
115	FR + AS	22.54	21.46	4.25	2.01	1.45
116	OB + FR + AS	15.08	18.11	0.34	-0.31	-2.19
117	AL	24.67	36.02	4.13	1.95	1.41
118	OB + AL	17.21	27.49	0.22	-0.40	-2.24
119	FR + AL	23.47	21.46	3.39	1.60	1.16
120	OB + FR + AL	16.01	18.11	-0.53	-0.75	-2.49
	Bio of 1 and 6					
121	CS + FR + AS	11.53	21.46	7.54	3.56	2.53
122	CS + FR + OB + AS	7.66	18.11	2.67	0.75	-1.46
123	CS + FR + AL	13.91	21.46	6.29	2.97	2.10
124	CS + FR + OB + AL	9.54	18.11	1.64	0.26	-1.80
125	AS	16.95	36.02	7.99	3.79	2.73
126	OB + AS	13.08	27.49	2.48	0.67	-1.47
127	FR + AS	12.03	21.46	6.23	2.95	2.14
128	OB + FR + AS	8.16	18.11	1.35	0.13	-1.85
129	AL	19.33	36.02	6.38	3.02	2.18
130	OB + AL	14.96	27.49	1.22	0.07	-1.90
131	FR + AL	14.41	21.46	4.99	2.36	1.71
132	OB + FR + AL	10.04	18.11	0.33	-0.3	-2.20
	Bio of 1 and 7					
133	CS + FR + AS	14.82	19.87	6.81	3.21	2.27
134	CS + FR + AL	16.18	19.87	5.70	2.68	1.89
135	AS	24.33	36.02	11.38	5.38	3.89
136	FR + AS	19.41	21.46	5.49	2.60	1.88
137	AL	25.69	36.02	9.12	4.31	3.12
138	FR + AL	20.77	21.46	4.38	2.08	1.50

/continued

Alternative Number	Description	BOD (tons/day)	Flow (USMGD)	Present Value ($m) Case 2	Case 3	Case 1
	Bio of 2 and 6					
139	AS	16.50	36.02	9.12	4.31	3.12
140	DB + AS	10.00	34.22	10.12	4.75	3.28
141	OB + AS	12.63	27.49	3.62	1.20	-1.08
142	FR + AS	15.90	21.46	6.74	3.19	2.31
143	DB + OB + AS	6.13	25.69	4.62	1.63	-0.92
144	DB + FR + AS	9.40	19.66	7.68	3.59	2.44
145	OB + FR + AS	12.03	18.11	1.75	0.32	-1.72
146	DB + OB + FR + AS	5.53	16.31	2.88	0.82	-1.49
147	AL	19.11	36.02	7.27	3.44	2.48
148	DB + AL	12.61	34.22	8.27	3.87	2.64
149	OB + AL	14.74	27.49	2.11	0.49	-1.59
150	FR + AL	17.91	21.46	5.38	2.56	1.84
151	DB + OB + AL	8.24	25.69	3.11	0.92	-1.43
152	DB + FR + AL	11.41	19.66	6.38	2.98	2.00
153	OB + FR + AL	13.54	18.11	0.62	-0.22	-2.10
154	DB + OB + FR + AL	7.04	16.31	1.62	0.22	-1.94
	Bio of 2 and 7					
155	AS	23.88	36.02	12.51	5.92	4.28
156	DB + AS	17.38	34.22	13.51	6.35	4.44
157	FR + AS	23.28	21.46	5.88	2.79	2.01
158	DB + FR + AS	16.78	19.66	6.89	3.22	2.17
159	AL	25.47	36.02	10.01	4.73	3.42
160	DB + AL	18.97	34.22	11.01	5.17	3.58
161	FR + AL	24.27	21.46	4.74	2.24	1.62
162	DB + FR + AL	17.77	19.66	5.74	2.68	1.79
	Bio of 6 and 7					
163	CS + FR + AS	12.27	21.46	9.07	4.23	3.04
164	CS + FR + DB + AS	5.77	19.66	10.07	4.71	3.21
165	CS + FR + AL	14.71	21.46	7.55	3.56	2.53
166	CS + FR + DB + AL	8.21	19.66	8.55	3.99	2.69
167	AS	17.69	36.02	15.06	7.12	5.14
168	DB + AS	11.19	34.22	16.06	7.55	5.30
169	FR + AS	12.77	21.46	7.76	3.67	2.65
170	DB + FR + AS	6 27	19.66	8.76	4.11	2.81
171	AL	20.13	36.02	12.05	5.70	4.11
172	DB + AL	13.63	34.22	13.05	6.13	4.27
173	FR + AL	15.21	21.46	6.23	2.95	2.14
174	DB + FR + AL	8.71	19.66	7.23	3.39	2.30
	Bio of 2, 6 and 7					
175	AS	11.39	36.02	17.16	8.11	5.86
176	DB + AS	4.89	34.22	18.16	8.55	6.02
177	FR + AS	10.79	21.46	10.02	4.74	3.42
178	DB + FR + AS	4.29	19.66	11.02	5.18	3.59
179	AL	14.71	36.02	13.75	6.50	4.70
180	DB + AL	8.21	34.22	14.75	6.94	4.86
181	FR + AL	13.51	21.46	8.02	3.79	2.74
182	DB + FR + AL	7.01	19.66	9.02	4.23	2.90

/continued

Alternative Number	Description	BOD (tons/day)	Flow (USMGD)	Present Value ($m) Case 2	Case 3	Case 1
	Bio of 1, 6 and 7					
183	CS + FR + AS	6.42	21.46	10.09	4.76	3.39
184	CS + FR + AL	9.51	21.46	8.34	3.93	2.79
185	AS	11.84	36.02	16.14	7.63	5.51
186	FR + AS	6.92	21.46	8.77	4.15	3.00
187	AL	14.93	36.02	12.90	6.10	4.41
188	FR + AL	10.01	21.46	7.02	3.32	2.40
	Bio of 1, 2 and 7					
189	AS	5.54	36.02	13.42	6.34	4.58
190	FR + AS	5.59	21.46	7.02	3.32	2.40
191	AL	8.86	36.02	10.76	5.09	3.68
192	FR + AL	8.31	21.46	5.56	2.63	1.89
	Bio of 1, 2 and 6					
193	AS	10.65	36.02	10.14	4.79	3.46
194	OB + AS	6.78	27.49	4.75	1.74	-0.70
195	FR + AS	10.05	21.46	7.64	3.62	2.61
196	OB + FR + AS	6.18	18.11	2.88	0.85	-1.33
197	AL	9.51	36.02	8.12	3.84	2.77
198	OB + AL	9.54	27.49	3.00	0.91	-1.29
199	FR + AL	12.71	21.46	6.13	2.90	2.10
200	OB + FR + AL	8.34	18.11	1.57	0.24	-1.77
	Bio of 1, 2, 6 and 7					
201	AS	5.54	36.02	18.06	8.54	6.16
202	FR + AS	4.94	21.46	10.25	4.85	3.51
203	AL	9.51	36.02	14.50	6.86	4.95
204	FR + AL	8.31	21.46	8.16	3.86	2.79
205	CS + FR + OB + AS	3.97	18.11	5.67	2.16	-0.43
206	CS + FR + OB + AL	6.37	18.11	4.03	1.39	-0.99

5. ABITIBI PAPER CO. LTD., IROQUOIS FALLS

5.1 The Existing Mill[1].

Figure 3 is a simplified diagram of the sewer system of the existing mill and shows the assumed BOD and flow rates prior to additional treatment.

5.2 The Waste Treatment Alternatives

The types of treatment or waste reduction methods considered are[2]:

---

1. Based on the description in Reference 5.

2. Possible waste reduction methods not included in the analysis because of their relatively high costs are:

   - close down existing pulping processes, produce 882 tons/day of the existing 980 tons/day pulping production by mechanical pulping, buy 98 tons/day of kraft pulp and mix these pulps together:

     - estimated capital cost = $25m
     - assuming
       - existing sulphite production = 230 tons/day
       - existing groundwood production = 750 tons/day
       - price of kraft pulp = $250/ton
       - operating and maintenance cost of existing sulphite production = $60/ton and of existing groundwood production = $g/ton and of mechanical pulping = $4.50 + g/ton
       - 360 operating days/year:

       estimated annual operating and maintenance costs of this waste reduction method =

       $$(250 \times 98 \times 360 - 60 \times 230 \times 360 + (4.50 + g) \times 882 \times 360 - g \times 750 \times 360)/10^6 \ (\$m)$$

       i.e. greater than $5.28m

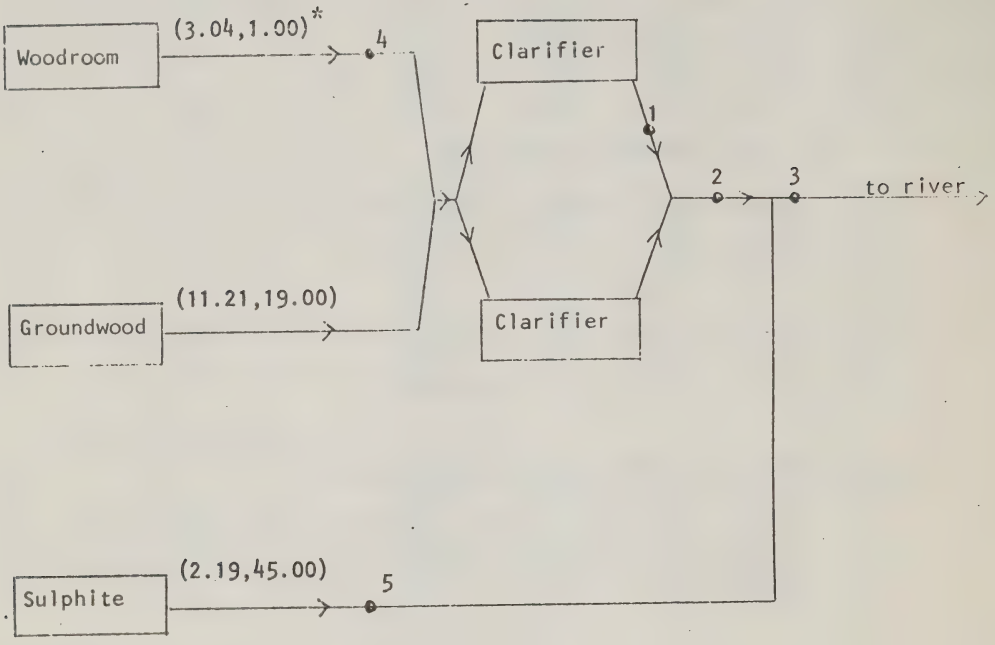
   - close down the existing sulphite pulping process and buy 230 tons/day of sulphite pulp:

     - estimated capital cost = $0m.
     - assuming price of sulphite pulp = $240/ton:
       estimated annual operating and maintenance costs of this waste reduction method =

       $$(240 \times 230 \times 360 - 60 \times 230 \times 360)/10^6 \ (\$m)$$

       i.e. $14.90m.

THE EXISTING MILL - ABITIBI PAPER CO. LTD., IROQUOIS FALLS



*(Flow (USMGD), BOD (tons/day))

FIGURE 3

- dry barking (affecting waste flow 4[1]);
- chemical recovery (affecting waste flow 5);
- biological treatment (aerated lagoon or activated sludge) of the following possible combinations of waste flows:
  - 1 only
  - 2 only
  - 3 only
  - 5 only
  - 4 and 5.

The complete set of alternatives analyzed is derived as follows:

dry barking or no dry barking

plus chemical recovery or no chemical recovery

plus activated sludge treatment of one of the combinations of waste flows listed above or no activated sludge treatment

plus aerated lagoon treatment of one of the combinations of waste flows listed above or no aerated lagoon treatment

with the following exclusions:[2]

- not both activated sludge and aerated lagoon treatments;
- if dry barking, not biological treatment of waste flow 4;
- if chemical recovery, not biological treatment of waste flow 5;

but including the following two alternatives:

- chemical recovery plus activated sludge treatment of waste flows 4 and 5;
- chemical recovery plus aerated lagoon treatment of waste flows 4 and 5.

---

1. See Figure 3.

2. See Footnote 1 on page 9.

5.3 The Treatment Efficiencies

This Section states the assumed per cent reductions in BOD and flow rates achieved by the possible treatments.[1]

	BOD	Flow Rate[2]
Dry Barking		
Waste flow 4:	100%	100%
Chemical Recovery		
Waste flow 5:	100%	0%
Activated Sludge		
Waste flow 1:	90%	0%
Waste flow 2:	90%	0%
Waste flow 3:	90%	0%
Waste flow 4:	90%	0%
Waste flow 5:	90%	0%
Aerated Lagoon		
Waste flow 1:	80%	0%
Waste flow 2:	80%	0%
Waste flow 3:	80%	0%
Waste flow 4:	80%	0%
Waste flow 5:	80%	0%

Additional assumptions on which the calculations of BOD and flow rates at the river are based are:

- one half of the total flow from the woodroom and groundwood processes flows through one clarifier and the other half through the other clarifier;
- each clarifier reduces the BOD in the waste flow through it by 15% but does not affect the flow rate;
- when waste flows 4 and 5 are biologically treated, waste flow 4 does not pass through the clarifier;
- when there is chemical recovery plus biological treatment of waste flows 4 and 5, chemical recovery occurs before the waste flows pass through the biological treatment.

---

1. The values were specified by P.A.Victor, on the basis of a literature survey. See References 2,3,6,7 and 8.
2. These values were used only to calculate design capacities of biological treatment. The flow rates at the river for each treatment alternative were not calculated for this mill.

5.4 The Capital Costs and the Annual Operating and Maintenance Costs

This Section states the capital and annual operating and maintenance costs assumed in the calculation of present values.

	Capital Cost ($m)	Annual Operating and Maintenance Costs ($m)
Dry Barking[1]	1.25	0.00
Chemical Recovery[2]	9.00	-0.50

The capital cost ($m) of activated sludge treatment is assumed to be given by the following expression[3]:

$$\left((x/y)/(13.6/20.63) \right)^{0.177} f(y)$$

where x = BOD treated by activated sludge (tons/day);

y = design capacity of activated sludge (USMGD):

$f(y)$ = capital cost ($m) of activated sludge as for Eddy Forest Products, Espanola, at design capacity y, taken from Figure 2;

assuming design capacity is 25%[4] greater than actual flow treated.

---

1. Values specified by E.W. Turner, Industrial Wastes Branch, Ministry of the Environment.

2. Values based on data in Reference 4 adjusted upwards. The annual operating and maintenance costs are roughly equivalent to a saving of $6/ton of sulphite pulp, assuming sulphite pulp production is 230 tons/day and there are 365 operating days per year.

3. On the assumptions in Section 4, x=13.6 and y= 20.63 (corresponding to alternative number 135 in Section 4.5) implies the capital cost of activated sludge ($m)=f(20.63). Therefore, the following is a possible model, giving capital costs for different values of both x and y and giving the correct value when x=13.6 and y=20.63:

   capital cost of activated sludge ($m) = $((x/y)/(13.6/20.63))^a f(y)$.

   The value a=0.177 is obtained by fitting the model to the following data: when x=62.00 and y=20.55 (corresponding to activated sludge treatment of waste flow 3 in Figure 3), capital cost of activated sludge ($m) = 7.20 (from Reference 5).

4. Value specified by E.W. Turner, Industrial Wastes Branch, Ministry of the Environment.

The following additional assumptions are made:

- the aerated lagoon capital cost is $1m[1] (for a pipeline carrying the wastes across the river from the mill to a possible lagoon site) plus 66% of the activated sludge capital cost for the same BOD (tons/day) and design capacity (USMGD);
- the annual operating and maintenance costs of activated sludge treatment are 25%[2] of the capital cost;
- the annual operating and maintenance costs of aerated lagoon treatment are 25%[2] of the capital cost excluding the cost of the pipeline across the river.

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1. Estimated by E.W. Turner, Industrial Wastes Branch, Ministry of the Environment.
2. Based on the relative costs given in Reference 5 for aerated lagoon and activated sludge treatments of the mill effluent.

5.5 Results of the Calculations

For a given waste treatment alternative, the BOD at the river and the present value for each of the three tax situations are calculated using the expressions in Section 3.5 and the assumptions in Sections 5.3 and 5.4. The results of these calculations are listed below, using the following notation and grouping the alternatives according to which waste flows are biologically treated:

DB = dry barking
CR = chemical recovery
Bio = biological treatment
AS = activated sludge
AL = aerated lagoon

Alternative number	Description	BOD (tons/day)	Present Value ($m) Case 2	Case 3	Case 1
	No bio				
1	no other treatment	62.00	0	0	0
2	DB	61.15	1.25	0.54	0.20
3	CR	17.00	5.77	2.25	-0.19
4	DB + CR	16.15	7.02	2.79	0.01
	Bio of 1 only				
5	AS	54.35	8.26	3.97	3.11
6	DB + AS	53.88	8.47	4.01	2.92
7	CR + AS	9.35	14.02	6.22	2.92
8	DB + CR + AS	8.88	14.23	6.26	2.73
9	AL	55.20	6.44	3.05	2.21
10	DB + AL	54.69	7.04	3.28	2.17
11	CR + AL	10.20	12.21	5.30	2.02
12	DB + CR + AL	9.69	12.75	5.50	1.95
	Bio of 2 only				
13	AS	46.70	13.70	6.59	5.16
14	DB + AS	46.62	12.96	6.17	4.62
15	CR + AS	1.70	19.47	8.84	4.97
16	DB + CR + AS	1.62	18.73	8.42	4.43
17	AL	48.40	10.01	4.76	3.56
18	DB + AL	48.23	9.98	4.69	3.28
19	CR + AL	3.40	15.78	7.02	3.36
20	DB + CR + AL	3.23	15.75	6.94	3.09

/continued

Alternative number	Description	BOD (tons/day)	Present Value ($m) Case 2	Case 3	Case 1
	Bio of 3 only				
21	AS	6.20	18.64	8.96	7.02
22	DB + AS	6.12	17.76	8.48	6.43
23	CR + AS	1.70	20.62	9.39	5.41
24	DB + CR + AS	1.62	20.08	9.07	4.94
25	AL	12.40	13.34	6.36	4.81
26	DB + AL	12.23	13.13	6.21	4.47
27	CR + AL	3.40	16.58	7.40	3.67
28	DB + CR + AL	3.23	16.61	7.36	3.41
	Bio of 5 only				
29	AS	21.50	5.77	2.77	2.17
30	DB + AS	20.65	7.02	3.31	2.37
31	AL	26.00	4.85	2.29	1.62
32	DB + AL	25.15	6.10	2.83	1.82
	Bio of 4 and 5				
33	AS	20.75	9.32	4.48	3.51
34	AL	25.35	7.17	3.40	2.49
35	CR + AS	16.25	10.49	4.52	1.58
36	CR + AL	16.35	9.91	4.19	1.15

6. DISCUSSION OF THE APPROACH

As well as the procedure described in this report, we considered the use of more formal mathematical models[1] to analyze the waste treatment alternatives at a mill. We prefer the procedure because of its following advantages over the models considered:

- an explicit list of all the waste treatment alternatives is obtained;
- the BODs, flow rates and present values of all the alternatives, rather than just of the optimal alternative, are available at the end of the calculations;
- because all the results are available, they can be displayed graphically, thus allowing the alternatives satisfying various BOD, flow rate and budgetary constraints to be readily identified;
- the procedure is valid without requiring that the cost and treatment efficiency data satisfy restrictive mathematical conditions.

The procedure can be applied to mills with more alternatives than those considered in this report, but the workload involved would be greater. This workload has two parts: the information collection and the

1. For example, mathematical programming formulations were considered with variables corresponding to the types of treatment, objective functions equal to the present values of the costs of treatment, linear constraints on the variables expressing restrictions on the possible combinations of treatment, and linear constraints expressing restrictions on the allowed BOD and flow rate at the river.

calculations. The information collection workload depends on how much information is needed for the given mill and how much of this information is available from existing documentation. Using the sources stated in Sections 4 and 5, this workload was roughly 5 man-days for the Eddy mill and roughly 2 man-days for the simpler Abitibi mill (some of the data for this mill was taken from the Eddy data). We found the calculation workload to be roughly 1½ man-days per 100 alternatives, using a programmable calculator for the last step of the procedure.[1,2]

The procedure can be used to calculate wastes other than BOD and flow rate, provided the wastes can be properly quantified (e.g. suspended solids - tons/day).[3] We considered including toxicity and colour in our analyses of the two mills. However, we could not find an adequate quantification of the toxicity and colour of the existing waste flows and of the reductions achieved by the possible treatments.

Another extension is to include changes in level of production and product mix as waste reduction methods. These changes could be adequately represented by specifying discrete levels of production for each of several product mixes. The calculation procedure would be similar to that in Appendix C, except that the production changes would be included in the derivation of the alternatives and possible changes in revenue would be included in the present value calculations.

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1. See Appendix C. Some of the other steps could also be carried out on a programmable calculator.

2. A computer program to carry out the entire calculation procedure for any given mill could be developed. However, such a program would be complicated and we do not recommend its development unless a large number of analyses are to be carried out.

3. Further, the procedure is valid for the analysis of air as well as water pollution abatement alternatives.

Finally, the present value expressions[1] could be readily modified to allow study of how various financial policy decisions might affect the preferred waste treatment alternative. Such decisions include effluent charges, depreciation allowances and capital cost subsidies. Changes to the tax rate can be studied with the expressions in their present form.

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1. See Section 3.5.

APPENDICES

APPENDIX A

TERMS OF REFERENCE AND STUDY CONDUCT

TERMS OF REFERENCE

Request

The request for this study was made on October 19, 1973, by Mr. J.W. Gilbert, then Director of the Strategic Planning Branch, Ministry of the Environment, to Mr. J.J. Thacker, then Director of Management Science Branch. The terms of reference were presented under cover of a memorandum dated November 30, 1973, to Mr. V.W. Rudik, Acting Director, Strategic Planning Branch, from Mr. Thacker.

Background

The Strategic Planning Branch, Ministry of the Environment, is undertaking a study of the effects of alternative pollution abatement policies on the Ontario pulp and paper industry. As part of this study the Branch intends to develop a model of the alternatives for waste treatment and reduction in a mill. The model is to be used to assess the impact of proposed policies on each mill's costs, and thus profits.

The Management Consulting Services Division has been asked to provide advice on the development of the model.

Scope

Our principal role will be to assist in designing the model, particularly

its mathematical formulation, and to recommend a solution strategy. We will also advise on the selection and use of available computer software needed to carry out the solution.

We are not able to provide computer programming but can, on request, assist the Ministry in arranging for programming and computer processing.

Conduct of Study and Timing

Jack Donnan of Strategic Planning Branch is project leader. Management Science Branch will assign Philip Wormwell to the project. However, it is important to note that Philip will not be available, on average, for more than roughly one day per week until the end of January, 1974. It is possible, depending on developments with current commitments, that we can then make additional time available.

STUDY CONDUCT

The study team was Peter Victor of Strategic Planning Branch and Philip Wormwell of Management Science Branch. Margaret McLay of Strategic Planning Branch shared in the calculations and plotted the results.

Discussions on possible mill models were begun in November 1973. In January 1974, it was decided to develop a procedure, rather than a model, whereby the possible waste treatment alternatives at a mill could be identified and their costs and resulting wastes could be calculated by hand. The procedure was then applied to two mills. The necessary data was provided by Peter Victor and Ed Turner of Industrial Wastes Branch, Ministry of the Environment.

APPENDIX B

REFERENCES

1. Chemetics International Ltd., "Waste Water Treatment Study for Eddy Forest Products Ltd., Espanola, Ontario", April 1973.

2. Federal Water Pollution Control Administration, U.S. Department of the Interior, "The Cost of Clean Water, Industrial Waste Profiles, No.3, Paper Mills", November 1967.

3. Federal Water Pollution Control Administration, U.S. Department of the Interior, "Cost of Conventional and Advanced Treatment of Waste Waters", July 1968.

4. Stanley Associates Engineering Ltd., "Pollution Abatement Study for Sulphite Pulp Mills", 1973.

5. J.H. Day and C.J.N. Eland, "Report on BOD_5 Reductions, Iroquois Falls Division, Abitibi Paper Company Ltd.", June 1972.

6. Design Approvals Section, Sanitary Engineering Branch, Ontario Ministry of the Environment, Publication No. 1, "A Guide on Estimating Sewage Treatment Plant Construction Costs in the Province of Ontario", May 1973.

7. Environmental Directorate, OECD, Paris, "Advanced Pollution Abatement Technology in the Pulp and Paper Industry", 1972.

8. K.L. Shah, G.W. Reid, Journal of the Water Pollution Control Federation, Vol. 42, pp. 776-793, "Techniques for Estimating Construction Costs of Waste Treatment Plants", 1970.

APPENDIX C

LIST OF CALCULATION STEPS

The following are the main steps in calculating the BOD, flow rate and present values of each waste treatment alternative, given the definition of the alternative, the treatment efficiencies, the capital costs and the annual operating and maintenance costs:

- identify which types of treatment are applied to each waste flow, using the definition of the waste treatment alternative and including any existing treatment (e.g. pond, clarifier);
- calculate the BOD of each waste flow after all its treatments, using the specified percent reductions in BOD;
- sum these BOD values to find the BOD at the river;
- calculate the flow rate of each waste flow after all its treatments, using the specified percent reductions in flow rate;
- sum these flow rate values to find the flow rate at the river;
- if the waste treatment alternative includes biological treatment, sum the flow rate values of the biologically treated waste flows just prior to their biological treatment;
- from this sum, calculate the required design capacity of the biological treatment;

- in the case of Section 5.5, sum the BOD values of the biologically treated waste flows just prior to their biological treatment;
- using these values of design capacity and BOD treated, find the biological treatment capital cost as explained in Sections 4.4 and 5.4;
- using this biological treatment capital cost, calculate the biological treatment annual operating and maintenance costs as explained in Sections 4.4 and 5.4;
- identify the capital costs and annual operating and maintenance costs of the other treatments (excluding existing treatments) included in the waste treatment alternative;
- sum the capital costs of the biological and other treatments to find the total capital cost of the alternative;
- sum the annual operating and maintenance costs of the biological and other treatments to find the total annual operating and maintenance costs of the alternative;
- using the expressions stated in Section 3.5, calculate the present values of the alternative in the three tax situations, i.e. cases 1, 2 and 3.

Note that there are many possible ways of organizing the calculations when many waste treatment alternatives are being considered. Rather

than carrying out all the above steps for each alternative in turn, we found it more efficient to carry out the first step for all the alternatives, then the second step for all the alternatives, and so on. We also used a programmable desk calculator to carry out the last step.

SUPPLEMENT TO ANALYSIS OF WASTE TREATMENT ALTERNATIVES: EDDY FOREST PRODUCTS LTD., ESPANOLA AND ABIBITI PAPER CO. LTD., IROQUOIS FALLS

P. Victor
Ministry of the Environment

Introduction

After the completion of the report prepared by the Management Consulting Services Division of the Ministry of Government Services, it was discovered that some of the assumptions contained in the report concerning depreciation allowances were inappropriate for Ontario. It was necessary, therefore, to change these assumptions and to adjust the calculations based on them accordingly.

To facilitate comparisons between this supplement and the main body of the report, the same section headings as are used in the report are repeated here with the additions of an 'a' to the section number. Hence, section 3.3 Tax Situations becomes 3.3a Tax Situations.

3.1a Definitions

An additional parameter is defined and it is assumed to be the same for each waste treatment alternative:

a = depreciation rate (% per annum/100) of the undepreciation capital cost

3.3a Tax Situations

Case 1: Unchanged

Case 2: Unchanged

Case 3: As before except that the depreciation allowance is a percentage of the undepreciated capital cost. In year n the allowance is assumed to be the undepreciated capital cost at the end of year n-1.

- In year j, j=1,...n-1 the depreciation allowance is $aC(1-a)^{j-1}$. In year n the depreciation allowance is $C(1-a)^{n-1}$.

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3.4a Tax Avoided

Case 1: Unchanged

Case 2: Unchanged

Case 3: Tax avoided ($m) in years j, j=1...n-1

$$= r\{M+w_jC+aC(1-a)^{j-1}\}$$

Tax avoided ($m) in year n

$$= r\{M+w_nC+C(1-a)^{n-1}\}$$

3.5a Present Value

Case 1: Unchanged

Case 2: Unchanged

Case 3: Present value ($m) =

$$\sum_{j=1}^{n-1} \{M+zC-r(M+w_jC+aC(1-a)^{j-1})\} /(1+d)^j$$

$$+ \{M+zC-r(M+w_nC+C(1-a)^{n-1})\}/(1+d)^n$$

3.5a Assumed Values of the Parameters

As before with the addition of:

$$a = 0.20$$

4.5a Results of the Calculations

The results of the calculations are unchanged for cases 1 and 2. The revised calculations for case 3 are listed by the alternative numbers.

Alternative number	Present Value ($m) Case 3	Alternative Number	Present Value ($m) Case 3
	No Bio		
1	0.49	7	-3.09
2	0.76	8	-2.82
3	-2.60	9	0
4	-2.33	10	0.28
5	0	11	-3.09
6	0.28	12	-2.82

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Alternative Number	Present Value ($m) Case 3	Alternative Number	Present Value ($m) Case 3
	Bio of 1 only		
13	1.32	19	0.84
14	-1.80	20	-2.26
15	1.14	21	0.65
16	-1.95	22	-2.43
17	.84	23	0.65
18	-2.26	24	-2.43
	Bio of 2 only		
25	1.49	33	1.20
26	-1.61	34	-1.89
27	1.77	35	1.47
28	1.13	36	.91
29	-1.32	37	-1.62
30	-1.94	38	-2.18
31	1.43	39	1.19
32	-1.66	40	-1.90
	Bio of 4 only		
41	2.04	47	1.56
42	2.32	48	1.83
43	1.73	49	1.80
44	2.02	50	2.08
45	2.26	51	1.26
46	2.53	52	1.53
	Bio of 5 only		
53	0.98	65	-2.32
54	1.26	66	0.78
55	-2.11	67	-2.59
56	-1.83	68	-2.31
57	0.88	69	0.40
58	1.17	70	0.68
59	-2.21	71	-2.70
60	-1.92	72	0.40
61	0.50	73	-2.41
62	0.77	74	0.68
63	-2.59	75	-2.69
64	0.50	76	-2.41
	Bio of 6 only		
77	2.54	83	-1.31
78	2.82	84	-1.04
79	-1.00	85	2.74
80	-0.16	86	3.03
81	1.97	87	-0.94
82	2.40	88	2.06

Alternative Number	Present Value ($m) Case 3	Alternative Number	Present Value ($m) Case 3
	Bio of 6 only (cont'd)		
89	-0.67	95	-1.39
90	2.33	96	1.65
91	-1.49	97	-1.11
92	-1.21	98	1.93
93	2.20	99	-1.79
94	2.48	100	-1.52
	Bio of 7 only		
101	2.22	107	1.75
102	2.51	108	2.02
103	1.88	109	3.29
104	2.15	110	3.57
105	4.13	111	1.39
106	4.42	112	1.68
	Bio of 1 and 2		
113	2.06	117	1.64
114	-1.04	118	-1.44
115	1.69	119	1.35
116	-1.36	120	-1.73
	Bio of 1 and 6		
121	2.97	127	2.49
122	-0.50	128	-0.99
123	2.48	129	2.55
124	-0.91	130	-1.04
125	3.20	131	1.99
126	-0.54	132	-1.42
	Bio of 1 and 7		
133	2.68	136	2.19
134	2.23	137	3.63
135	4.53	138	1.75
	Bio of 2 and 6		
139	3.63	147	2.90
140	3.92	148	3.17
141	-0.09	149	-0.69
142	2.69	150	2.16
143	-0.18	151	0.42
144	2.94	152	2.43
145	-0.84	153	-1.29
146	-0.49	154	-1.00

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Alternative Number	Present Value ($m) Case 3	Alternative Number	Present Value ($m) Case 3
	Bio of 2 and 7		
155	-4.99	159	3.98
156	5.26	160	4.27
157	2.35	161	1.89
158	2.63	162	2.17
	Bio of 6 and 7		
163	3.53	169	3.09
164	3.86	170	3.38
165	2.97	171	4.80
166	3.25	172	5.08
167	6.09	173	2.49
168	6.27	174	2.77
	Bio of 2, 6 and 7		
175	6.83	179	5.48
176	7.12	180	5.76
177	3.99	181	3.19
178	4.28	182	3.48
	Bio of 1, 6 and 7		
183	3.98	186	3.50
184	3.28	187	5.14
185	6.43	188	2.80
	Bio of 1, 2 and 7		
189	5.34	191	4.29
190	2.80	192	2.21
	Bio of 1, 2 and 6		
193	4.04	197	3.24
194	0.36	198	-0.34
195	3.05	199	2.44
196	-2.57	200	-0.27
	Bio of 1, 2, 6 and 7		
201	7.19	204	3.25
202	4.09	205	-0.69
203	5.78	206	-0.04

5.5a Results of the Calculations

The results of the calculations are unchanged for cases 1 and 2. The revised calculations for case 3 are

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listed by the alternative numbers.

Alternative Number	Present Value ($m) Case 3	Alternative Number	Present Value ($m) Case 3
	No Bio		
1	0	3	0.86
2	0.35	4	1.21
	Bio of 1 only		
5	3.48	9	2.58
6	3.39	10	2.65
7	4.35	11	3.44
8	4.26	12	3.49
	Bio of 2 only		
13	5.78	17	4.07
14	5.29	18	3.89
15	6.65	19	4.95
16	6.15	20	4.75
	Bio of 3 only		
21	7.86	25	5.48
22	7.32	26	5.22
23	7.13	27	5.28
24	6.72	28	5.12
	Bio of 5 only		
29	2.43	31	1.91
30	2.78	32	2.26
	Bio of 4 and 5		
33	3.93	35	2.86
34	2.88	36	2.47

APPENDIX H

PROCEDURE FOR ESTIMATING MILL COSTS REVENUES AND PROFITS

Establishment data from the Industrial Census were withheld as confidential by the Ontario Statistical Centre so that estimates of the costs, revenues, gross profits for individual mills were made from 1971 aggregated Industrial Census data. The 1971 costs and value of shipments were aggregated for five product categories: bleached kraft pulp, newsprint (Ca base sulfite pulp), newsprint (Na base sulfite pulp), fine papers and paper board.

Costs were apportioned among each mill in the following manner:

Wood costs were assigned to mills in each product group on the basis of the proportion of the total average daily wood used by each mill. Wages and salaries were divided on the basis of mill employment. Materials and other costs were apportioned to individual mills on the basis of output. The three component costs estimated individually for each mill were then summed to obtain the total cost per mill.

Revenues or values of shipments were also divided among each mill on the basis of output. However, revenue from the primary product was calculated on the basis of production of that primary product alone. Revenue from other sources was divided on the basis of the distribution of production of subsidiary products in the group. Gross margins and profits were then calculated as described in the text.